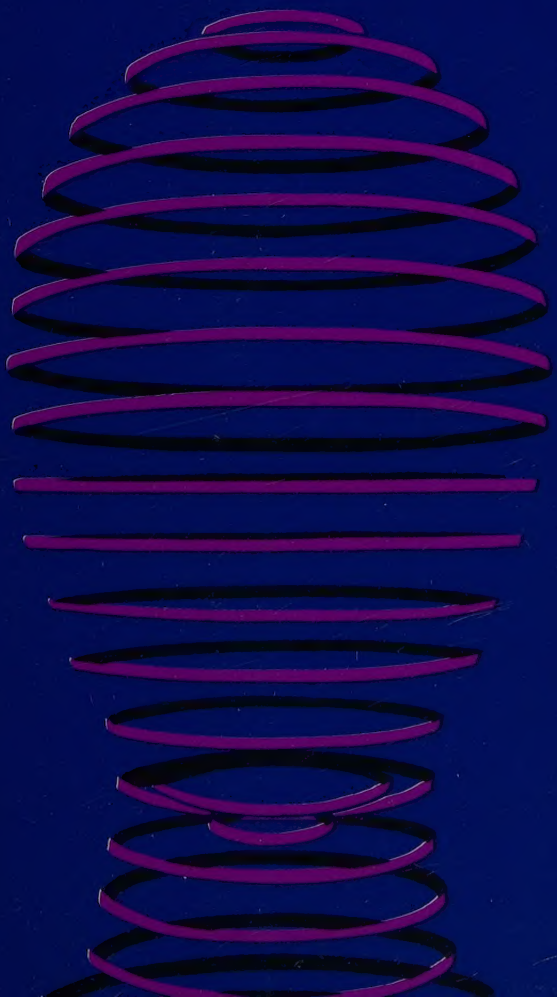
THE SCIENCE OF DREAMS

An analysis of what you dream and why

EDWIN DIAMOND



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Q. How often do we dream each night? **A.** Five or six times.

Q. How long do dreams last? **A.** About 20 minutes on the average.

Q. What happens if we are deprived of normal dreaming? **A.** Tensions build up and, if deprived of dreams long enough, hallucinations may occur.

EDWIN DIAMOND

THE SCIENCE OF DREAMS

is an engaging study of what modern scientists are learning about dreams, dreaming, and dreamers (i.e., everyone). Today's psychologists and physiologists have recently added a wealth of fascinating material to the dream concepts of Freud, Jung, and other psychoanalytic investigators.

After following modern dream analysis closely for several years, Edwin Diamond, Science Editor of *Newsweek*, presents an absorbing and authoritative picture of dreaming in the patterns of modern life. He discusses the human use of dreams to maintain sanity; the influence of fleeting suggestions on future dreams; the relationship of sexuality and dreams; the role of dreaming in primitive societies; the topics

(continued on back flap)

The Science of Dreams

EDWIN DIAMOND

The Science of Dreams

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For Ellen, Franna, and Louise

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CHAPTER ONE

The Science of Dreams

Souls, Minds, and Brains · The Man inside the Man · Early Attempts to Interpret Dreams · Dream Books

In an unadorned cubicle in the University of Chicago's Abbott Hall, two studious-looking explorers began the quest. They were out to catch dreams—live, vivid, pulsating dreams—before they had been transformed into pale memories. Their hunting ground was the quiescent mind of a sleeping figure stretched out in the next room. Their weapons were an electroencephalograph machine (EEG) and small disc electrodes attached near the eyes and on the scalp of their subject.

A deep, nocturnal silence prevailed, marred only by the soft rubbing of a pen as it traced a record of brain waves and eye movements on the EEG's slowly turning drum. Sud-

denly a telltale track took shape on the moving graph paper —a sure sign that the first act of the dream play was about to begin; then the pen traced a sharp rise and fall as the subject's eyes moved back and forth under the eyelids. The plot of the dream was unfolding. The investigator sounded a bell. The subject in the next room struggled awake.

"Were you dreaming?" one of the explorers asked him over the intercom.

"Yes," the subject replied, and began talking into the microphone of the tape recorder next to his bed:

"I was dreaming something about a woman. The last scene was something about some kind of involvement where she's trying to do something about her inheritance and I'm trying to thwart her. I must have thwarted her pretty well, but she still has something she can do, and I'm saying—we're in some kind of dining room—'Let me see your trump card. Let me just look at you.' I went over and looked at her in the face and I said, 'How can I possibly be afraid of you?' She just wouldn't let me look her in the eye. She just kind of turned away a little. And just as the bell went off, I was chasing her out and I shouted, 'You god-damned bitch.' The first part of the dream is kind of vague. It was a race against time to get someplace. It was something to do with this inheritance. I could see the whole thing like a map and the different routes I had to go to beat the other people. I seemed to know the progress the other car was making. Then I remember getting out of my car and running because I saw someone who I thought was going to the place where we were racing to. There was something about a man who was —who looked old, but was really young. He had a beard and everything, but still he was really young compared to somebody else. And we had to do something with an old man who was going to die soon to get his money. This part was all vague, and then somehow we're in this house and I

was trying to thwart this woman. I think she was in the other car I was racing with. The woman was a woman I'd never seen before."

The dreamer had graphically captured the immediacy of his dream. Through with his tale, he replaced the microphone, resettled himself in the cot, and soon drifted off to sleep again.

The drum turned in the next room once again. The pen traced a normal sleep pattern for another eighty-five minutes until the familiar track returned to the drum. The explorers sounded their bell and woke the sleeper, again asking him to tell his dream. He answered:

"I don't remember too clearly, but anyway, I was watching a guy standing in the street. Suddenly he raised his gun and shot a woman in the back. I'm sure it was a woman. And I ran. There was a little frame house sitting on the street. Just a few rooms, five or six. I ran in the front door and started running out the back. I was afraid this guy would come out the back door. Somehow I knew he was on my side, yet I was afraid he could come after me. I felt frightened and anxious when I woke up and didn't know why, because at first I couldn't remember the dream."

Two more times during that night the bell was sounded and the dreamer was awakened. Two more richly detailed dreams were caught:

"This dream started out at a—no—oh, Lord, it started out with Miss C [a well-known singer]. She seduced me. That's how it started. I don't remember how we got undressed or anything, but we got undressed and she was kind of neurotic —she scorned any way of conventional intercourse. I'd try to do it conventionally and she'd just sneer at me. She had me doing all these different things. . . . There were three of us actually. Some other girl was helping her, and it was funny because they were just casually explaining what they

wanted me to do and I didn't feel embarrassed or anything. . . . Miss C was very impatient. 'Let's get on with it,' she said. Finally I got mad and left. I got mad and went into my room and leaned on a chair. I leaned resting my right hand on it and tuning a TV set with my left. So then I came back and sat down to dinner. And all of a sudden I looked at my hand. It seemed like we were in a family circle and I was part of an entirely different family than I should have been. And then I looked at my hand and it had started bleeding. First my little finger was bleeding and then it looked like my whole damn hand was bleeding. And then there was a series of cuts clear up my arm. I was kind of stunned and somebody said there was a razor blade on that chair. I remember remarking that I'd like to clobber the guy who left a razor blade there, and the memory came to me in the dream that I had left a razor blade there myself some time previously and forgotten about it. And then I was amazed that I didn't feel myself cutting myself when I had my hand on the chair. I went back into the living room where I had been having intercourse with Miss C and now it seemed to be a little first-aid station and there was a little Negro maid and she started to wash my hand off. It was still bleeding a little bit. I asked her if she didn't have some gauze, and while I was waiting for her to get some gauze, there was a boy there and he was asking me about a pile of duck decoys that were made out of sponges and he said he was puzzled. He said, 'Is this a bald-eagle decoy?' There was one decoy in the pile that—the others were painted brown with yellow heads—and this one was the bald eagle and it was just solid yellow and it looked like it was made out of a sponge and I started explaining to him all about the theory of how you sometimes only need one characteristic to fool animals. And I explained how chickens avoided a silhouette of a bird if it had

its wings anterior like a chicken hawk, and just about that time the bell went off."

Then, an hour and a half later, he was awakened and reported his fourth dream:

"It had something to do with bridge. We were sitting at the bridge table. Just three of us, these two women and I. There was something about how a hand had been played wrong. I was very puzzled about the way it had been played. Then I looked at my cards and they were the wrong kind of cards. I didn't know what to do, and then I woke up."

When morning came, the explorers had four new trophies in their bag. As close as words could catch them, they were what the dreamer had dreamed, undistorted by the thousand and one gaps and disguises that usually mar the remembered visions of sleep. Running through them, in fact, was a pattern that, when studied by a psychiatrist, could provide a clue to the dreamer's personality (the sequence above is analyzed for its possible meaning in Chapter Nine).

SOULS, MINDS, AND BRAINS

There have been many other exciting catches from such nights of modern dream monitoring. As a result of thousands of similar experiments conducted since 1952, centuries of speculation and popular mythology about dreams and sleep have at last been set straight. For the first time the amount, frequency, and content of dreaming have been precisely determined; we now know that dreaming is as natural as eating or breathing, that every night every one of us dreams once every ninety minutes of sleep. The length of these dreams runs from ten minutes to almost one-half hour. During a typical night of eight hours' sleep, approximately

20 per cent of the night, or one hour and thirty-six minutes, is spent in dreaming. At the same time, too, man has opened a new window into the deepest self and can seek there some illumination about his own origins, nature, and eventual destiny. The philosophers of an earlier day regarded dreams as activities of the *soul*. Later, psychologists and psychiatrists substituted the place name *mind;* while physiologists and neuroanatomists dealt with the more tangible province of the *brain*. Whichever topography of the dream was used, the specialists sensed that the dream was bound up with man's essential image of himself. Now these three provinces of soul, mind, and brain are coming together, as Sigmund Freud shrewdly sensed when he said that "the relation of the mental to the physical states . . . is the problem for the future." A new science of dreams is emerging, which permits investigators to study under controlled laboratory conditions the old impressionistic concepts of soul and mind. A yardstick has been put to consciousness, to sleep, to memory, to thought, and to unconsciousness. Students of human behavior, for example, now have before them a record of a dream, a psychological activity, correlated with a record of brain waves, eye movements, and other physiological activities. The soul of man, the "far country" that Heraclitus said could not be explored or approached, is at last being reached.

This book is a report on these new discoveries about dreams, the brain, and behavior; on the new science of dreams that has evolved from them; and on the deeper illuminations of the soul that these investigations have provided. It is not a book of famous dreams, nor is it a review of dream theories, ancient or modern. Nor does this book explain dreams according to any single school of interpretation. Although each of these themes is touched on, my primary purpose is to report on some exciting research,

whose full implications are only now becoming known and appreciated.

In the last decade there has been a quantum jump, a breathtaking increase in man's knowledge of his nocturnal life. The study of dreams today is in much the same situation as the study of the atom's nucleus: new experiments have upset old notions; established ideas are being revised, and new theories constructed. It is the purpose of this book to describe some of the elements of this change, largely by recounting the experiments and reasonings of the men responsible. In order to understand their work, it is necessary to double back and discuss some of the old traditional concepts before relating them to the new developments.

THE MAN INSIDE THE MAN

Since man's earliest beginnings, dreams have disturbed both his waking and sleeping hours. It is possible that from this primal interest in dreams man may have evolved his original religious beliefs and first notions of the soul and of death. The evidence, while necessarily indirect, is strong. Sir Edward B. Tylor (1832–1917), the first occupant of a chair of anthropology at Oxford University, theorized that primitive people were greatly troubled by two biological enigmas: the difference between a living body and a dead one, and the human-seeming shapes in dreams and visions. The savage philosopher, Tylor held, inferred that every man had both a life and a phantom, entities separate from his physical body. The next step was to combine the two entities into the idea of a "ghost soul." Such a ghost soul could appear to a man awake as a vision or asleep as a dream—a phantasm separate from the body but bearing a likeness to it. Based on the "evidence" of these dream apparitions, Tylor suggested that

there next developed the idea of the soul's existence after death.[1]

Sir James G. Frazer (1854–1941) developed a similar theme of animism, or the belief that all objects possess a vitality and a soul, in his classic study of myth, *The Golden Bough*.[2] An animal or man lives and moves, the primitive believed, only because there must be a little animal or little man inside, who lives and moves. The man inside the man, the animal inside the animal, is the soul. If life is explained by the soul's presence, the opposite of life is explained by the soul's absence. Sleep then becomes the temporary absence of the soul, and death its permanent absence. In dreams the soul wanders away from the body—visiting the places, seeing the persons, and performing the acts of which the dreamer dreams. Frazer cited these examples of primitive thought that survived to his day:

A Macusi Indian (of British Guiana), in weak health, dreamed his employer had made him haul a canoe up a series of difficult cataracts. When he awoke, he bitterly reproached his master for making him go out and work all night.

A Guinea Negro woke in the morning with aching pains; he concluded his soul had been thrashed by another soul during the night's wanderings.

A Fijian at Matuku (an island in the Lau group in the Southwest Pacific), awakened from a nap when someone accidentally stepped on his foot, was heard bawling loudly after his soul and imploring it to return. He had been dreaming he was across the sea in the Tonga Islands and "great was his alarm on suddenly awakening to find his body in Ma-

[1] This argument is developed in Tylor's classic *Primitive Culture: Researches into the Development of Mythology, Philosophy, Religion, Language, Art, and Custom*. London: John Murray, 1873. 2 vols. See especially Vol. I.

[2] New York: The Macmillan Company, 1947. (Abridged edition.)

tuku." Hence the common rule in Fiji and elsewhere: don't awaken a sleeping person, because his soul is away and might not have time to get back. If it is absolutely necessary to rouse him, however, do it gradually, to allow the soul time to get back.

There is an old Transylvanian folk saying that warns parents never to let a child sleep with his mouth open, because his soul may escape.

EARLY ATTEMPTS TO INTERPRET DREAMS

With the beginning of the historic age—the time when man became able to produce documents that tell in written words something of his life—the evidence of interest in dreams became direct. It is the nature of dreams that they need interpretation, that they are often enigmatic and veiled. One of the oldest known written documents is an Egyptian book of dream interpretations, the Chester Beatty Papyrus 3 of the Twelfth Dynasty (2000–1790 B.C.), now in the possession of the British Museum (and named in honor of its donor). Some 200 dream entries are preserved. Each entry consists of a description of a dream act, a statement that the dream is good or bad, and the meaning of the dream for the dreamer's future. Here is a typical entry:

If a man sees himself in a dream:

Sawing wood, *good;* his enemies are dead.
Seeing the moon shining, *good;* pardoning of him by his god.
Looking out of a window, *good;* the hearing of his wish by his god.

Seeing himself dead, *good;* it means a long life for him.
Drinking his own urine, *good;* eating his son's own possessions.
Eating crocodile flesh, *good;* ruling as an official among his people.
Seeing people afar off, *bad;* his death is at hand.
Copulating with his wife in daylight, *bad;* the seeing of his misdeeds by his god.
Looking into a deep well, *bad;* his being put in prison.
Drinking warm beer, *bad;* suffering will come upon him.[3]

Similar prognostics were incised on the clay tablets found in the royal library of the Assyrian Emperor Assurbanipal (he reigned from 669 to 626 B.C.) in Nineveh. The tablets were part of the first known library in Asia and were the repository of learning and folklore dating to Nippur and the fifth millennium—a Great Books of the ancient Near Eastern world. In addition to predictions, the Assyrian dream books offer rituals to protect against evil dreams and to bring good dreams of a happy future. One prayer goes:

> My gracious god stand by my side
> . . . My friendly god will listen to me:
> God Mamu of my dreams,
> My God, send me a favorable message.

The Greeks, Romans, and Hebrews were heirs to both the animistic notions of primitive man and the dream-interpretation methods of the Egyptians and Assyrians. The philosopher Democritus (460–370 B.C.), whose doctrine that the world was made up of bits of matter called atoms has been in a sense upheld by modern physics, thought that dreams

[3] These excerpts are from *Hieratic Papyri in the British Museum,* Sir Alan Gardiner, editor, 3d series. Chester Beatty gift, Papyrus 3, 1935.

were caused by other bodies, minds, or souls that entered the sleeper's body through the open pores and revealed to the sleeper's mind the present passions and future designs of others. The Greek biographer Plutarch, whose *Parallel Lives of Illustrious Greeks and Romans* was written in the first century A.D. and is still read today for its insights into human nature, was a great believer in divination in general, whether by dreams, sneezes, or other omens. In his *Symposiac VIII* he gravely discussed the question: "Why are prophetic dreams in autumn least reliable?" One possibility, he answered, was the proposition advanced by Aristotle that the eating of autumn fruit so disturbs the digestion that the soul's prophetic faculty is distracted. A second possibility, if one goes along with Democritus, was that the falling leaves of autumn ruffle the air and disturb the souls wandering in search of a dreamer. And the third possibility, Plutarch concluded, was that in the declining months of the year *all* the faculties, including the dream-divination one, are in decline.

Among the early Hebrews dream interpretation was highly valued. In Jerusalem at the time of Christ there were some twenty-four interpreters of dreams practicing their art, according to the Talmud. Another scholar, the Reverend Father Myles M. Bourke, professor of scripture at St. Joseph's Seminary, Yonkers, New York, recently suggested that the three Magi, or wise men, who sought out the Christ child were priests of an Eastern cult skilled in dream interpretation. With the triumph of monotheism and the Hebrew-Christian doctrine of individual moral responsibility, however, there was a strong reaction to dream interpretation and to the search for fateful signs in dreams. As Professor A. Leo Oppenheim has pointed out in his invaluable monograph *The Interpretation of Dreams in the Ancient Near East*, the Bible placed "the unshakable will of the Lord above the

desperate attempts of the mantics to foresee the course that events are to take."[4] Only the dream book itself seemed resistant to this trend.

DREAM BOOKS

Between the time of Democritus and the beginning of the Christian era there were twenty-six Greek dream books, arranged much like the Chester Beatty Papyrus 3. According to Oppenheim, all of these collections have been lost with one exception: the *Oneirocritica* (from the Greek *oneiros*, a dream) of Artimedorus, who lived in the second century under the Roman emperor Antoninus Pius. Artimedorus was Italian by birth, a physician by training, and a Greek rationalist by world outlook. He energetically gathered his material by traveling in Greece, Italy, and Asia Minor, by correspondence, and by purchasing old manuscripts. His collection, written in an Attic style that Professor Lynn Thorndike of Columbia University judged "pure and refined," consisted of five books, three devoted to dream interpretation and the last two to a study manual for his son, an apprentice dream interpreter. From the content and format of his books, it is clear that he had seen copies of the early dream books. His prognostics rely on elaborate word plays, such as to dream of a muddy stream means ill treatment in court (a stream is like a judge because it goes where it wants); on contraries, such as to dream of being mad is good; and on symbols, such as to dream of ants which are industrious is good for the husbandman because they signify fertility; to dream of a tapeworm means an enemy is sharing your table. But Artimedorus was no mere copyist. He was too much a rationalist to accept all the ancient "wisdom." While he had no doubt

[4] *Transactions of the American Philosophical Society*, Vol. 46, Part III. Philadelphia: The American Philosophical Society, 1956.

that the gods sent dreams to men, he had considerable misgivings about his own system for explaining the dreams. In his frank counsel to his son he advised: "Try to give the causes of everything and to employ in each case some logical and convincing explanation, for if you give base and curt forecasts, you will seem little skilled no matter how truly you speak. But do not be deceived into thinking that these logical connections control the outcome. We believe we discover fulfillment for past experience, but we build up reasons for ourselves alone, each according to his own ability."

Despite Artimedorus' doubts, his works had incredible literary staying power. Harry B. Weiss, a bibliophile who has diligently traced the *Oneirocritica's* publishing history in *The Bulletin of the New York Public Library* for June and July 1944, regards it as "the father of all [later] dream books. . . . his successors for the most part have only made such additions and modifications as seemed necessary to adjust the interpretations to their own times." In one regard the successors seemed to be superior to the master. Their choice of titles showed greater imagination than anything Artimedorus might have conjured up. Among the eighteenth-century chapbooks Weiss mentions is *Dreams and Moles with their Interpretation and Signification made far more Manifest and Plain than any Published to the very meanest Capacities, by the most ancient as well as the most modern Rules of Philosophy*, to which is prefixed "A Collection of Choice and Valuable Receipts Concerning Love and Marriage. First compiled in Greek, and now faithfully rendered into English by a Fellow of the Royal Society, and a true Lover of Learning."

In the United States the dream interpretations found in the *Book of Knowledge*, printed in 1795, by Charles Pierce of Portsmouth, New Hampshire, echoed the old Egyptian and Babylonian conceits:

To dream of mules signifies sickness.
To dream your feet are dirty signifies tribulations.
To see yourself with the devil signifies gain.
To dream of washing in the water denotes an easement from pain or trouble.
To dream of money signifies loss.

In addition to dream interpretation, this book gave advice on how to foretell the future by moles, fingernails, the shape of the head, cards, dice, dominoes, tea leaves; where to dig for coal, water, and metals; and how to make your sweetheart love you. In 1850 the Philadelphia firm of Henry F. Anners offered, for sixty cents, *The American Lady's Every Day Hand-book of Modern Letter Writing, Language and Sentiment of Flowers, Dreams. Their Origin, Interpretation and History, Domestic Cookery.*

Weiss found that dream books still sell briskly, particularly to players of the numbers, or policy, game. The output of one Cleveland firm, according to Weiss, was three million books a year. In New York City's Times Square today a casual stroller can buy a dozen different dream books in five minutes. Like the omens of the ancient Egyptians, the books are arranged alphabetically, so that the players can look up their dreams and find the number to play. In the *Magical-Spiritual Dream Book*, players are told: "Dream of peanuts, play 354"; "Dream of suspenders, play 563." This "prayer," echoing across five millennia back to the Assyrian ritual to Mamu, is published on the cover page:

Now I lay me down to slumber;
When I sleep and when I wake,
Pray God I hit the number.

But the dream books have not been immune to change; their sales pitch now reflects an emphasis on objective, "scientific" research. "This unusual, remarkable, and entirely useful book," writes Pete Quinn in *Policy Pete's Mutual Number Dream Book* (1956), "is the combined results [*sic*] of several years of patient, diligent, and exacting research work. . . . It was only by constant association with a various number of experienced and highly successful players that I discovered the amazing and proven fact that dreams actually do assist the human mind."

Policy Pete's discovery that dreams serve a useful psychic function, like his prognostics, was derivative. The notion had occurred to Sigmund Freud some fifty years before, with consequences that once again changed man's evaluation of his dream life.

CHAPTER TWO

Freud and the Iroquois

Maury's Dreams · Dreams as Meaningful Mental Activity · The Iroquoian Cult of Dreams · *Ondinnonk*, *Ononharoia*, and False Faces · Freud's Interpretation of Dreams · Irma's Injection · Levels of the Dream · Sex and Symbols · Some "Typical" Dreams · Dreams as Therapy

Dreams, a popular nineteenth-century saying went, come from indigestion.

This attitude represented the complete victory of "rationalism" and the scientific method over the brooding, animistic spirits of the ancients. The saw, of course, was recognized as an oversimplification. Stated more elaborately, the physicians and psychologists a hundred or more years ago held that dreams were caused by somatic stimuli. Since simple cause-and-effect relationships were being observed and stud-

ied with success in the physical sciences, it seemed only a matter of time before similar relationships would be observed in the psychological sciences. There was much evidence to commend this view: Almost anyone could recall how a blanket tossed aside during the night seemed to produce a dream of freezing. A Scots doctor named Robert MacNish (1802–37) collected a series of such dreams. They summon up nostalgia for a dear, departed era: One man who was "sleeping with a hot poultice on his head" dreamed he was being scalped by a band of red Indians; another, "wearing a damp nightshirt," dreamed of being dragged through a stream; a third reported that once, "when lying with his feet on a hot-water bottle," he dreamed he had climbed to the top of Mount Etna and that the ground there was intolerably hot.

One nineteenth-century investigator suggested that nightmares were caused by a condition of the blood, specifically by an excess of "carbonic gas." Others thought it was a case of the sleeper's position interfering with the normal flow of blood. One researcher went so far as to fasten clothes over the mouth and nose of a sleeping subject. Predictably, "the face of the sleeper became suffused . . . and the respiratory muscles were thrown into violent action." Upon awakening, the sleeper related a nightmare about a monster.[1]

MAURY'S DREAMS

It remained for an endlessly ingenious French archivist named Louis Ferdinand Alfred Maury (1817–92) to conduct a series of systematic cause-and-effect experiments. Maury is credited with history's first thorough attempt to determine

[1] These dreams and similar examples have been collected in an anthology called *The World of Dreams,* edited by Ralph L. Woods. New York: Random House, 1947.

the precise effect of experimentally introduced stimuli upon the course of dreams. Maury was his own best subject, and his imaginative successes are worth recording above and beyond their historical interest:

1. Maury's lips and the tip of his nose were tickled with a feather; he dreamed of a frightful form of torture—that a mask made of pitch was placed on his face and then pulled off, taking his skin off with it.

2. A pair of scissors was scraped across a pair of pliers; he dreamed of pealing bells and the revolutionary days of 1848.

3. He was given some eau de cologne to smell; he was in Cairo in his dream and had some absurd adventures he could not recall.

4. He was pinched lightly on the neck. He dreamed he was being given a mustard plaster and thought the doctor had treated him like a child.

5. A hot iron was brought close to his face. He dreamed that some robbers had entered the house and were forcing the victims to give up their money by burning their feet in braziers of hot coal.

6. Water was dropped on his forehead. He was in Italy, sweating violently and drinking white Orvieto wine.

Maury also credited himself with the dream that became famous as the "guillotine dream." It seems that in his dream he was brought before a revolutionary tribunal during the French reign of terror. Robespierre and Marat questioned him. He was condemned, led to the scaffold, bound to a plank by the executioner, and the guillotine blade fell. He felt his head separate from his body—and then woke to find the top of his bed had fallen and struck the base of his neck. This guillotine dream, it should be added, set off a lively

controversy in the august *Revue Philosophique*. How, it was asked, did Maury elaborate his dream and crowd so much detail into the short time interval between the collapse of the bed and his awakening? One popular answer was that in dreams "everything happens in a flash." A less charitable answer might be that M. Maury's waking imagination was working overtime when he recollected the dream. The matter was finally settled in 1957, when the Maury experiments were repeated at the University of Chicago using the new dream-monitoring technique. The results gave qualified support to the influence of outside stimulation on dream content, but completely demolished the notion that "everything happens in a flash" in dreams (see page 116).

In Maury's day, however, stimuli experiments became a moderately popular pastime among psychologists. In the United States in the late 1890s Professor Will S. Monroe, of the State Normal School, Westfield, Massachusetts, improved upon Maury. He attempted to measure the effect of colored objects on dreams. He instructed twenty young women in his senior psychology class to stare "intensely" for two to ten minutes before going to bed, at, successively: paper cut-outs of a green square, a violet octagon, a red square, a violet heart, a green robin, a yellow coffee cup, a blue Maltese cross, a pink circle, a blue triangle, a green hen, a blue cat. When they recorded their dreams the next morning, color proved to be a pronounced feature in forty-seven dreams, with red leading the list with seventeen mentions. In a second experiment Monroe induced the girls to wash out their mouths before retiring, place a crushed clove on their tongues, and permit it to remain through the night. The twenty girls dutifully fulfilled his request for ten successive nights and reported a total of 254 dreams. Almost half of them had the usual visual imagery; but seventeen dreams had strong taste elements in them, and eight had elements of smell. One girl

dreamed of "tasting" cloves; another dreamed of giving a school recitation on the importation of cloves from the Moluccas Islands; several reported dreams of tasting and eating fruit—oranges were the most frequently mentioned. One girl dreamed her dormitory was on fire; before going to sleep she had remarked to her roommate that the clove was "burning the mouth out of me." The rather unusual presence of so many taste and smell elements in the dreams, Monroe offered cautiously, suggests "the peculiar character of the experiment as the cause."

No account of experimentally produced dreams would be complete without including those of the indefatigable English psychologist A. J. Cubberly. Maury, according to Cubberly, "overshoots the mark" with his heavy-handed and unsuitable stimuli. Professor Cubberly preferred instead to use a "feeble" means of influence: tiny *tensors* (small squares of gummed paper, sticking plaster, glue, etc.) and *detensors* (oil, glycerine, fresh cream, or butter) applied to the skin surface. Using himself as a subject and recording his dreams in the morning, Cubberly solemnly reported these prize dreams in the *British Journal of Psychology* in 1923:

Tensors on mid-sole, right foot: people are dancing on a verandah. . . . A woman dances in the center, but clumsily, as if there were lameness in one foot or the other. The other men and women are clumsy also.

Detensor on the buttock: at a football match which is also confused with the theatre. I am directed to the wrong seat, and when I find mine, someone else is in possession.

These results, Cubberly concluded, proved that slight physical tensions "beyond the reach of our waking perceptions may have a dominating influence upon the dream." For readers who wanted to see (and feel) for themselves, Cub-

berly cautioned that they may have to adjust the tensor or detensor size—"especially women with their greater sensitivity."

DREAMS AS MEANINGFUL MENTAL ACTIVITY

Cubberly, Maury, and the other early advocates of somatic stimulation, for all their scientific methodology, told only part, although a colorful part, of the story of dreams. That there was another part of the story to tell—the role of psychic stimuli—had been suggested by poets and philosophers. "Infected minds to their deep pillows will discharge their secrets," Lady Macbeth observed. "Dream attitudes bespeak the dreamer's true nature," Schopenhauer wrote. But the prevalent view of the professional psychologist at the turn of the century was best expressed by a Professor Jessen in this partial check list of familiar dreams and their causes: "The creaking of a door may produce a dream of burglars; if our bedclothes fall off during the night, we may dream, perhaps, of walking about naked. . . . Accumulations of semen lead to lascivious dreams; local pains produce ideas of being ill-treated, attacked, or injured. . . ."

The monumental break with these dominant attitudes was made, as every college freshman knows, by Sigmund Freud. In the name of science, Freud restored the dream to its ancient position of meaningful communication and made dream interpretation a pillar of his psychoanalytic structure. What is not well known, however, is that the psychoanalytic theory of dreams was anticipated 300 years before Freud by the Iroquois Indians, who lived in what is now western New York State and southern Ontario. The seventeenth-century Iroquois were a people without written language, without the wheel, with none but the most rudimentary artifacts.

But their ideas of dreaming and of the mind are strikingly similar to Freud's. Freud and the Iroquois have been compared in detail for the first time by the cultural anthropologist Anthony F. C. Wallace, who is clinical research director of the Eastern Psychiatric Research Institute in Philadelphia. In an essay in the April 1958 issue of the *American Anthropologist*, Dr. Wallace cited some of the similarities in Freudian and Iroquoian dream theory. Both suggested (1) that the mind was divided into conscious and unconscious parts; (2) that the unconscious mind had desires the individual is unaware of, but which were expressed in dreams; (3) that repression or denial of these desires might cause mental and physical illness; (4) that these wishes were often expressed in symbols or in a cryptic language with two possible levels of meaning and, finally, (5) that the individual dreamer could not always interpret the dream himself but needed a specialist to help him get at the secret meaning. While these two theories are not precisely the same, Wallace had concluded, nevertheless, "the differences are not much more marked than the differences between, for instance, Jungian and Freudian varieties of psychoanalytic theory."

Outwardly no two societies appear more unlike than the Vienna of Freud and the palisaded villages of the Iroquois. On closer inspection, however, the reasons for the similarity in dream theory begin to emerge.

THE IROQUOIAN CULT OF DREAMS

"The craftiest, most daring, and most intelligent of North American Indians, yet still in the savage hunter state, the Iroquois were the terror of every native band east of the Mississippi, before the coming of the whites, who in turn learned to dread their ferocious power."

So the late Reuben Gold Thwaites, an authority on the American Indian, characterized the people of the loose confederacy of the Five Nations—Mohawks, Oneidas, Onondagas, Cayugas, and Senecas—and their cousins, the Hurons of Canada, at the time the first Europeans arrived in the early seventeenth century. Among the first arrivals were French Jesuit missionaries. From 1611 to 1768 these black-robed scholar-pioneers, "men astutely trained in letters and fortitude," sent back regular reports, or *Relations*, to their superiors in Quebec and Paris.[2] The *Relations* are among the major human documents in history. As Professor George N. Shuster has pointed out, the Jesuits were interested in what is now called cultural anthropology. Living among the Iroquois, they learned the language and observed at close hand Indian customs, religious practices, manners, and morals. Thanks to their physical courage and lucid reports, it was possible for Wallace to reconstruct the details of both the Iroquoian personality and the reigning "divinity of the dream."

The Iroquois male emerges from the Jesuit *Relations* as brave, resourceful, indifferent to pain, self-reliant, and emotionally independent. At the same time he was generous of spirit and mindful of his family and community duties. As a living prototype of this moral ideal, Wallace cites an Onondaga named Aharihon, the idol of every Iroquois youth and a leader devoted to his family and nation. Aharihon was a man of dignified and imposing appearance, a captain-general of his nation who had visited Montreal on a peace mission. But Aharihon also had a reputation as a killer. When his brother was slain in 1654 in one of the intermittent wars with the Erie, he vowed to avenge his death. Within a decade Aharihon was said to have killed sixty men with his own

[2] The *Relations*, long available only in a rare 73-volume edition, have been published for the first time in a single volume of selections, *The Jesuit Relations and Allied Documents*, edited by Edna Kenton. New York: Vanguard Press, 1954.

hands and to have tortured another eighty over slow fires. When he was finally captured by the French, Father Lalemont relates, he bore himself with "a gravity, a self-control, and a propriety which showed nothing of his barbarian origin."

The Jesuits learned, however, that there was another side to the Iroquois personality: a barbarism too grotesque for the good missionaries to understand, yet too important to go unrecorded. The Iroquois have, Father Fremin wrote, "properly speaking, only a single Divinity—the dream. To it they render their submission and follow all its orders with the utmost exactness . . . whatever it may be that they have done in their dreams, [the Senecas] believe themselves absolutely obliged to execute at the earliest moment. The other nations content themselves with observing those of their dreams which are the most important; but this people, which has the reputation for living more religiously than its neighbors, would think itself guilty of a great crime if it failed in its observance of a single dream. The people think only of that, they talk about nothing else, and all their cabins are filled with their dreams."

Father Ragueneau described the Iroquoian theory, Wallace comments, "in language which might have been used by Freud himself." His *Relation* is dated 1649:

"In addition to the desires which we generally have that are free, or at least voluntary in us . . . [our souls] have other desires, which are, as it were, inborn or concealed. These, they say, come from the depths of the soul, not through any knowledge, but by means of a certain blind transporting of the soul to certain other objects. . . . Now they believe that our soul makes these natural desires known by means of dreams, which are its language. Accordingly, when the desires are accomplished, it is satisfied; but, on the contrary, if it be not granted what it desires, it becomes

angry and . . . often it also revolts against the body, causing various diseases. . . . They call this Ondinnonk—a secret desire of the soul manifested by a dream."

The Iroquois also recognized, as Freud did, that the dream might conceal rather than reveal the soul's wish. In this case, there is a need to call in "certain persons, more enlightened than the common, whose sight penetrates, as it were, into the depths of the soul." These analysts "see the natural and hidden desire" that the soul has, though "the soul has declared nothing by dreams, or though he who may have had the dreams had completely forgotten them." In general, Wallace has distinguished two kinds of Iroquoian dreams: One is the simple "personal" dream, in which the interpretation and subsequent fulfillment is largely a private matter. The other is the "visitation" dream, which is believed to reveal the intentions of supernatural beings (an animistic element, of course, for which Freud had no use) and which may evoke widespread community participation both in interpretation and fulfillment. Some typical examples of the "personal" dream were reported by Father Fremin:

"He who has dreamed during the night that he was bathing, runs immediately as soon as he rises, all naked, to several cabins, in each of which he has a kettleful of water thrown over his body, however cold the weather may be.

"Some have been known to go as far as Quebec, traveling a hundred and fifty leagues, for the sake of getting a dog, that they had dreamed of buying there."

The second dream category, the "visitation" dream, involved highly emotional themes such as sex, aggression, torture, and the supernatural. Usually dreams of overt sexuality were acted out, according to Wallace, even though the Iroquois were generally modest in dress, often rather shy,

and valued chastity and marital fidelity. On one occasion in 1656 an Onondaga warrior came home from battle with the Erie "wasted, pale, depressed," and spitting blood. He announced he had a dream to tell the elders: during the campaign, he saw the culture hero Tarachiawagon (He-who-holds-up-the-sky). "If you wish me to continue my protection over you," Tarachiawagon told the warrior dreamer, "hear my words and execute my orders." Then Tarachiawagon demanded that the village sacrifice to his honor ten dogs and a quantity of beads, wampum, and sunflower seeds and beans. "And as for thee," he told the warrior, "let two married women be given thee, to be at thy disposal for five days." All of the dreamer's demands were fulfilled.

Another dreamer, an ancient, dying Huron (known for his virtue, writes Father LeJeune), reported that his dream wish required "dogs, flour, a three days' feast . . . some dances and like performances but principally . . . the ceremony of the *Andacwander*, a mating of men with girls, which is made at the end of the feast. He specified that there should be twelve girls, and a thirteenth for himself."

Nightmare dreams and aggressive dreams were frequently reported by warriors. In 1642 a Huron dreamed he was captured by non-Hurons. When he awoke, a tribal council was held because the "ill fortune of such a dream must be averted." The dreamer was tortured and burned with firebrands. Another warrior cut off his finger when he dreamed he had been captured and his enemies had cut off his finger. Another, to satisfy his dream commands, had himself stripped naked, bound, and dragged through the village. A fourth dreamed his cabin had burned down; after due deliberation the chiefs ceremoniously carried out the dream. But the tribal council was reasonable; if possible, it tried to satisfy the individual dreamer's dictates without too much inconvenience to the community as a whole.

ONDINNONK, ONONHAROIA, AND FALSE FACES

In addition to such *ad hoc* community participation in the individual's dream life, the Iroquois had regular, formal ceremonies intended to gratify dream wishes. Twice each year, at the midwinter and the green-corn ceremonies, dream-guessing rites were held in the longhouse, the village community center. The dreamer would announce in a riddle his "own and special" *Ondinnonk*, as revealed in his dreams. The dreamer, for example, might say, "What I desire is that which bears a lake within itself." Those who could not guess that what he wanted was a pumpkin or a calabash had to give him a present. Other dream riddles frequently involved the orgiastic *Andacwander* feast. "The riddle being guessed, there is no lack of persons to satisfy his desires," Father LeJeune noted dryly in an entry dated 1639. Once a year there was the ceremony of the Feast of Fools, or *Ononharoia*, the turning-the-brain-upside-down. Men and women dashed from cabin to cabin acting out their dreams in charades or giving cryptic clues to their dreams' contents. Then they demanded that the dream wishes be guessed and satisfied. During the *Ononharoia*, bad dreams and dreams of hostility were usually acted out in a symbolic way.

The dream-guessing and *Ononharoia* ceremonies were community-wide institutions, open to all. The dream cult was also observed by secret medicine societies. These societies were numerous and exclusive; each seemed to have jurisdiction over a particular disease, mental or physical symptomology, or dream vision. Dreams of false faces, for example, called for the ritual of the false-face society; a dream of dwarf spirits meant the dreamer needed the "dark

dance" of the little-people's society; dreams of illness required the medicine-men's society rite. The purpose of each society was to diagnose dreams and provide ritual treatment for illness.

Much of the Iroquois dream cult and many of these societies survive today in New York State. As far as the dream commands are concerned, however, there has been an understandable shift away from direct action toward symbolic gratification. In 1655, Father DeQuens related, when a Cayuga dreamed that he gave a feast of female human flesh, a young girl, adorned with ornaments, immediately was prepared for the execution by the Cayuga chiefs. But in 1958, when the critic Edmund Wilson visited the Iroquois for a series of articles for *The New Yorker* magazine, he found that the dream cult had become "more like that parlor game in which the company, by a series of questions, has to guess what historical characters somebody has in mind." The secret societies, however, still function. Wallace recently witnessed the rituals of the Company of Faces at the Coldspring, New York, reservation. In them he discerned the chief clue to the Iroquois dream culture. The Faces he watched in action wore masks of braided cornhusks. The members were stripped to the waist (although it was winter), carried turtle rattles, and shouted and howled at the top of their lungs. Inside the longhouse the sick who had dreamed of false faces were treated in a ritual dance. Here is how Wallace described the treatment in his essay, "Strategies in Iroquois Religious Therapy":

"The Faces swarm over them, blowing ashes on their heads, rubbing ashes in their hair, manhandling them with roughly tender, kindly hands, and dance around the Longhouse to the music of a turtle rattle and a singer singing for the Common Faces. The Doorkeeper's Dance which follows is for the Great World-Rim Being. And finally, all persons

within the Longhouse join in a round dance. Dancing is compulsory. Those who resist become possessed by the Faces and fall to the floor, crawl toward the fire, and shuffle the hot coals . . . The adult masker, wearing the face and impersonating the Great World-Rim Being . . . may gurgle and coo like a baby, crawl on the floor, suck his toes and beg for things to eat. He may thump with sticks on walls and windows, bang open doors, throw fires and ashes around, dance uninhibitedly. He may throw people out of bed, smear them with human excrement, upset the furniture, and frighten the timid with wild cries. And at the same time, he controls mighty matters, with the power to cure incurable diseases, avert deadly tornadoes, cast out malevolent old witches, and bring order to the whole community."

The masker, Wallace concluded, represents the child. He stands for all children, Wallace writes, who are "ambitious beyond their years, desirous of emulating their betters, mischievous and destructive, quickly enraged by neglect or frustration, careless of their parents' welfare, yet hopeful of forgiveness if these dreams of stolen glory are discovered." The contrast with the Iroquois ideal is dramatic; this ideal called for bravery, self-reliance, and independence—men who "cringed to no one and begged for nothing." But no man, Wallace argues, can balance forever on such a "pinnacle of masculinity." So in their dreams and rituals the Iroquois men (and the women) gave vent to those deep yearnings not permitted them in daily life. The Iroquoian dreams were not to brood over or ignore. Rather they were to be told, or at least hinted at, and it was up to other people to be active—to feed the dreamer, dance or sing for him, give him women and presents.

Thus, Wallace submits, the poised, self-controlled, self-sacrificing warrior in reality cherished strong, although unconscious, wishes to be passive—to beg, to be cared for, to

be an irresponsible, demanding infant. In the dream-guessing rites, this dependency is raised to an exquisite degree. The dreamer can't even ask for his wish; like a baby, he must content himself with cryptic signs and symbols until someone guesses what he wants. "The culture of dreams," Wallace concludes, "may be regarded as a useful escape valve in Iroquois life. . . . Iroquois men dreamt and, without shame, they received the fruits of their dreams and their souls were satisfied."

FREUD'S INTERPRETATION OF DREAMS

There is no evidence that Sigmund Freud had ever heard, directly or indirectly, of the Iroquois divinity-of-dreams culture when he was formulating his own views. It was a case of independent invention. But Freud had ample raw material for his own theory: in addition to being an authentic genius, a rigorously honest man, and a dedicated investigator, he was also a good dreamer. Two weeks after his engagement in June 1882, to Martha Bernays, the twenty-year-old daughter of a Hamburg merchant, he wrote her: "I have such unruly dreams. I never dream about matters that have occupied me during the day, only of such themes as were touched on once in the course of the day and then broken off." This idea, as Dr. Ernest Jones noted in his definitive chronicle of Freud's life and work, was to become an important part of his dream theory.[3] At other times Freud's early dream references were more conventional: once he mentioned "those disagreeable dreams that one has only

[3] *The Life and Work of Sigmund Freud*, Ernest Jones, 3 vols. New York: Basic Books, Inc., 1953, 1955, 1957. The material on the following pages is drawn from Jones' work and from Freud's *The Interpretation of Dreams*, translated and edited by James Strachey. New York: Basic Books, Inc., 1956.

when one's stomach is upset." On another occasion Freud reported a recurrent dream theme to Martha: "Last night I dreamt I was fighting someone for your sake and had the disagreeable feeling of being paralyzed just when I wanted to strike a blow. I often dream that and it comes at the place of the dream where I still have to pass my doctor's examination, a task which had tormented me for years." From our vantage point today, we can analyze this "anxiety dream" with a sharp Freudian insight. In 1886, however, the dream was opaque to its creator. Aside from these casual citations, the rest of Freud's formative dream life is lost to his biographers. Although there are indications that the young Freud kept an extensive dream book, it was apparently destroyed in April 1885, when Freud was twenty-eight, along with diaries he had kept for fourteen years. He gave his reason in an analogy that is (consciously or unconsciously) revealing: "The stuff simply enveloped me as the sand does the Sphinx."

Freud's first systematic observation of dreams is found in the account of the case history of Frau Emmy Von N., one of his Viennese patients. He discerned in her free-flowing, neurotic waking thoughts similarities to his own nightly dream thoughts. These dreams, by his own account, had been pressed to his attention by an uncomfortable bed. For several weeks, Freud wrote in *The Interpretation of Dreams*, he found himself obliged to exchange his "usual bed for a harder one, in which . . . I was unable to reach the normal depth of sleep." Each morning, fifteen minutes after wakening, Freud said, he remembered all the dreams he had had during the night and "took the trouble to write them down and try to solve them."

The time of the "hard-bed" dreams is put by Ernest Jones in the spring of 1895. In July of that year—Wednesday, July 24, to be exact—Freud conducted the first full-scale

analysis of one of his own dreams, the dream that became famous as "Irma's injection" (see below). In October of 1896, his father died; Freud was later to call it the "most important event, the most poignant loss of a man's life." Then, in the summer of 1897, Freud undertook his own psychoanalysis—an unsparing, detached, and daring exploration of his innermost thoughts, intimate dreams, and chaotic emotions. "The uniqueness of the feat remains," Jones wrote; "once done, it is done forever."

The Interpretation of Dreams was the product of this historic psychoanalysis. The publication date was actually November 1899, but the publisher put the date 1900 on the title page. Appropriately enough, the new century began with what is generally regarded to be Freud's greatest contribution to psychology. The book contained, Freud himself later wrote, "the most valuable of all the discoveries it has been my good fortune to make. Insight such as this falls to one's lot but once in a lifetime." By any standard *The Interpretation of Dreams* is a remarkable book. It contains the dreams of 105 normals—historical personages like Napoleon, dream experimenters like Maury, Freud's acquaintances, his colleagues, and his family, ranging from his nineteen-month-old daughter to his seventy-year-old grandmother. But Freud leaves untapped, or makes only passing use of, the reservoir of more than 1000 dreams he had accumulated from his neurotic patients. He reasoned that the analysis of these dreams would lead into the "highly bewildering" labyrinth of each patient's psychoneurosis. Instead he chose to recount forty-seven of his own dreams—which he characterized as "a copious and convenient material derived from an approximately normal person." Freud anticipated difficulties: the doubts of his auditors about the trustworthiness of self-analysis and his own "natural hesitation about revealing so

many intimate facts about one's mental life." When he set off for that "far country," the hidden self, leading the reader with him, he did not plunge in all at once, but lowered himself gradually, like a man getting into a hot bath.

IRMA'S INJECTION

The first and most famous dream that Freud reports in *The Interpretation of Dreams* is one of his own, that of Irma's injection. Freud required an entire page for a preamble to the dream. Irma, he explained, was a young widow, one of his patients and a family friend. He had achieved some therapeutic success with her, relieving her of hysterical anxiety, but she had broken off treatment for the summer vacation. The day of the dream Otto, a doctor and mutual friend of Freud and Irma, visited him. To Freud's inquiry about Irma's health, Otto answered, "She's better, but not quite well." Freud thought there was a tone of reproof in the words. The dream itself takes another page to tell:

A great hall—a number of guests, whom we are receiving —among them Irma, whom I immediately take aside, as though to answer her letter, and to reproach her for not yet accepting the 'solution.' I say to her, 'If you still have pains, it is really only your own fault.' She answers, 'If you only knew what pains I have now in the throat, stomach, and abdomen—I am choked by them.' I am startled, and look at her. She looks pale and puffy. I think that after all I must be overlooking some organic affection. I take her to the window and look into her throat. She offers some resistance to this, like a woman who has a set of false teeth. I think, surely she doesn't need them. The mouth then opens wide, and I find a large white spot on the right, and else-

where I see extensive grayish-white scabs adhering to curiously curled formations which are evidently shaped like the turbinal bones of the nose. I quickly call Dr. M, who repeats the examination and confirms it. Dr. M looks quite unlike his usual self; he is very pale, he limps, and his chin is cleanshaven. . . . Now my friend, Otto, too, is standing beside her, and my friend Leopold percusses her covered chest and says, 'She has a dullness below, on the left,' and also calls attention to an infiltrated portion of skin on the left shoulder (which I can feel in spite of the dress). M says, 'There's no doubt that it's an infection, but it doesn't matter; dysentery will follow and the poison will be eliminated.' We know, too, precisely how the infection originated. My friend Otto, not long ago, gave her, when she was feeling unwell, an injection of a preparation of propyl—propyls—propionic acid—trimethylamin (the formula of which I see before me, printed in heavy type). . . . One doesn't give such injections so rashly. . . . Probably, too, the syringe (*Spritze*) was not clean.

The analysis of his dream required ten pages. The long streamy associations freely flowed past events and persons and thoughts far beyond the hall. Irma became three people, one of them Freud's wife. The chemical trimethylamin calls up an old conversation with his colleague Wilhelm Fliess, who believed that a by-product of sexual metabolism was trimethylamin. This led, in the post-dream stream of thought, to Freud's theory that sexuality was a key to nervous disorders; this, in turn, led him to Irma's widowhood. But even Freud, the courageous explorer of the psyche, was unwilling to pursue every dream beast. When he came to the reference about examining Irma "in spite of her dress," he drew back: "Frankly, I had no desire to penetrate more deeply at this point."

The commentary on the dream took three more pages and led Freud to his first major conclusion. The dream, he declared, far from being a fragmentary or meaningless or absurd activity of the brain, is a highly complicated psychic phenomenon with a purpose: that purpose is the fulfillment of a wish. In the case of the Irma dream, Freud said his wish was: "I was not responsible for the persistence of Irma's pains—Otto was."

Wish-fulfillment dreams were easy enough for Freud to find. This was especially true of the dreams of children, who have simple and straightforward—Freud once used the word "pure"—dream lives. Freud observed this in his five-year-old son during an excursion into the mountains of upper Austria. The boy was excited; he anticipated seeing a particular hut on a particular mountain. But the party never got nearer than a telescopic view of the mountain. That night the disappointed boy dreamed he was in the hut. Another, more slothful form of wish-fulfilling dreams is one that Freud himself frequently dreamed. After working late at night, he naturally liked to sleep late in the morning—but there was work to be done and it was time to get up. On these sluggabed occasions, Freud said, he would dream he was out of bed and at the washstand. A full bladder, he added, would produce similar "convenience dreams." Freud pointed out that unusual or extreme circumstances, such as wintering over in the polar regions, also produced convenience dreams. He cited the antarctic expedition of the Swedish explorer Nils Otto Nordenskjöld; the men most frequently dreamed of eating and drinking, and of tobacco, of mail deliveries, and of ships in full sail coming in toward their camp.

There was another dream category that gave Freud more trouble. How could he maintain that dreams were wish fulfillments when so many people reported unpleasant, anxiety-laden dreams? For example, one of his patients, a woman of

"cheerful disposition," dreamed that her only child, a girl of fifteen, was "lying dead in a case." Freud suggested to the woman that the child in the case might correspond to the embryo in the womb. Upon being enlightened, he wrote, "she no longer denied that the dream-picture corresponded to a wish of hers. Like so many young married women, she had been far from pleased when she became pregnant; and more than once she had allowed herself to wish that the child in her womb might die. . . . Thus the dead child was the fulfillment of a wish, but a wish that had been put aside fifteen years ago." With examples such as this Freud was able to refine further his theory. He led his auditors down a bit deeper: the dream becomes a disguised fulfillment of a suppressed or repressed wish.

LEVELS OF THE DREAM

Two further elaborations were required. One was the distinction between the unconscious and the rest of the mental apparatus. The unconscious was that seething subterranean region of the mind to which instinctual wishes had been banished. These wishes, he said, were largely sexual impulses and egotistical feelings. The conscious waking mind was not of what Freud called "the prehistoric period"—the ages one to three. "I surmise the formula," he wrote in a letter to Wilhelm Fliess: "what was *seen* in that prehistoric period gives rise to dreams; what was *heard*, to fantasies; what was sexually experienced, to psychoneurosis. The repeating of what had been experienced in that period is in itself the fulfillment of a wish. A recent wish can bring about a dream only when it can become connected with material from the prehistoric period, when it is itself a derivative of a prehistoric wish or gets assimilated to one."

The second distinction is between the two levels, or strata, of the dream. One level Freud called the manifest content: this is the surface of the dream—the cluttered detail, the ingenious subterfuges, the fancy "dream work." The other level is the latent content—the "prehistoric" material from infancy, the true motive force behind the dream. In the manifest content of the dream there is usually a point of contact with some experience of the previous day—an unsolved problem, something unfinished, something rejected or repressed, or perhaps only some emotionally neutral material. In the case of Freud's Irma dream the day residue was Otto's accusatory tone; the wish was Freud's desire to be blameless of Irma's ills. But this, in Freud's view, was not enough to "instigate" the dream. It must awaken in the dreamer's unconscious a wish of the same tenor. This is the latent dream thought. In the Irma dream the latent thought involved, by Freud's own account, was his desire to vindicate his personal and professional ambitions. The strivings revealed in the Irma dream have been carefully analyzed in an essay by Dr. Erik H. Erikson of Harvard in the *Journal of the American Psychoanalytic Association* for January 1954. The Irma dream, Dr. Erikson holds, reflected a basic childhood conflict faced by Freud (and, Freudians would say, faced by all boys). One of Freud's earliest childhood memories was of the time when "I had disregarded the dictates of discretion, and had satisfied my needs in my parents' bedroom, and in their presence." Dr. Erikson takes this to mean that Freud had urinated in his parents' chamber pot. He was seven or eight at the time and was reprimanded by his father with the words, "that boy will never amount to anything." Freud's own comment on the episode was: "This must have been a terrible affront to my ambition. But allusions to this scene recur again and again in my dreams, and are constantly coupled with enumerations of my accomplishments and suc-

cesses, as though I wanted to say, 'You see, I have amounted to something after all.' " Erikson comments, "Maybe [by using his parents' chamber pot rather than his own] he wanted to show that he was a 'big squirt' and, instead, was called a small one. . . . It is thus clearer than ever why Dr. Otto had to take over the severe designation of a dirty little squirt." (Otto, the reader will recall, was equipped with a syringe, *Spritze*, which in colloquial German means "squirt.")

SEX AND SYMBOLS

The latent thought, then, comes from childhood. But it is never imported nakedly into the dream. Rather, the manifest content transcribes the latent thoughts into another mode of expression—a code, at once condensed and disguised, largely pictorial and expressed in symbols. This symbolic code is necessary, in Freud's famous analogy, because of the psychic censorship. As Freud pictured the origin of the dream: at night the conscious mind is concentrated on its desire to sleep, to rest the body; its wake-a-day censors are dozing at their posts. At the same time the unconscious is urgently demanding gratification of its deep-seated, infantile wishes. The dream becomes a compromise between the need of the irrational wish for gratification and the need of the body to sleep. The wishes don disguises in order to slip past the censors without awakening them (or the conscious mind, *i.e.*, the sleeper). Now the forbidden wishes cavort in the form of dreams. Since the dream wishes are largely of a sexual nature, most dream symbols are disguises for sexual objects and acts such as the genitals and intercourse. Finally sated, the unconscious subsides. The sleeper sleeps on undisturbed. However, on occasion, the symbolic disguises are so

thin that the censors are aroused and the sleeper awakened—the victim of a nightmare.

Because of these elaborate, personal disguises, one person can understand another's dream *only* if the dreamer is prepared to communicate all the unconscious thoughts lying hidden behind the manifest surface of the dream. Insofar as each man's dream world is unique, practical dream analysis, as the Irma analysis indicates, becomes a lengthy and involved process. The hallmark, indeed the caricature, of psychoanalytic method became the patient recumbent on a couch, eyes closed, in the position of the sleeper, recounting his dreamlike free associations.

SOME "TYPICAL" DREAMS

Freud also thought there were a certain number of general, or typical, dreams—dreams that almost everyone has had and that, one assumes, have the same meaning for everyone. In these Freud sought to demonstrate the role of the infantile suppressed wish:

1. Dreams of being naked. Freud believed most of his readers had experienced this dream. In it the dreamer feels shame, wishes to hide his nakedness by moving away, and finds he is unable to do so. The onlookers are typically indifferent to his plight. Sometimes the dreamer feels only vaguely undressed: "I was in my chemise or petticoat . . ." or "I was without a necktie . . ." Behind this dream, Freud thought, was the wish to recapture the earliest childhood paradise of unashamed nakedness, that climate of Eden before "anxiety awoke, expulsion followed, and sexual life and the tasks of cultural activity began."

2. Dreams of the death of a loved one. Freud had no difficulty explaining how egoism could lead a child to feel

his brothers and sisters were rivals, to harbor death wishes against them, and to dream of their departure. These dreams, of course, are disguised. For example, a four-year-old, the youngest of the family, had this recurrent dream: A whole crowd of children—all her brothers, sisters, and cousins of both sexes—were romping in a field. Suddenly they all grew wings, flew away, and disappeared.

But Freud granted it was harder to explain death wishes aimed at the parent, "whose preservation that same egoism should lead [the child] to desire." He thought he found the answer in the statistics of dreaming. Among his patients he noted that men dreamed mostly of their fathers' deaths and women of their mothers' deaths. This secret hostility he explained on the basis of instinctual sexual rivalry. Boys regard their fathers, and girls their mothers, as their rivals in love. This statement in *The Interpretation of Dreams* was Freud's first formulation of what he later called the Oedipus complex. Freud saw more than art in Sophocles' poetic tragedy. There is evidence, he said, that the Oedipus legend sprang from some "primeval dream material." As Jocasta tells Oedipus, "Many a man ere now in dreams hath lain with her who bore him."

3. Flying Dreams. Freud confessed that he was mystified by flying dreams because he never had them himself. But his experience with his patients convinced him that these are usually pleasant dreams that reproduce certain childhood genital stimulations from games of movement, swinging, seesawing, and roughhousing with parents or adult relatives.

4. Falling dreams. These are more anxious in tone. In the case of a woman who dreamed she was falling, Freud found the manifest content easy to interpret. Falling, he said, was symbolic of "surrender to an erotic temptation." More generally, falling dreams could be re-enactments of the infantile

experience of falling out of bed, being picked up, and being taken into bed with the mother or the nurse.

5. *Examination dreams.* These, also, are anxiety dreams. On the level of manifest content, they deal with "finals" or matriculation tests in school. Freud reported that in his dreams he was invariably being examined in history. The latent content, he suggested, related to the childish repetition of certain sexual acts in the face of parental scolding or self-opprobrium.

6. *Loss-of-tooth dreams.* Sexual repression, Freud contended, frequently causes transposition from the lower to the upper part of the body. These are dreams of castration—the feared punishment for engaging in the forbidden pleasure of masturbation.

7. *Swimming and water dreams.* These generally pleasant dreams, Freud maintained, are really fantasies of conception, of the womb, and of birth—the times of supreme security.

8. *Dreams of paralysis.* These dreams, involving a sense of inhibited movement, verge on anxiety. Freud describes them in the words of a man who is writing from personal experience: "One tries to move forward but finds oneself glued to the spot, or one tries to reach something but is held up by a series of obstacles. A train is on the point of departure but one is unable to catch it. One raises one's hand to avenge an insult but finds it powerless." The latent meaning of these dreams, Freud said, involved the inhibition of "sexual impulse."

9. *Dreams of robbers, burglars, and ghosts.* All of these dream figures originate, Freud said, "from one and the same class" of infantile memory. "They are the nocturnal visitors who rouse children and take them up to prevent their wetting their beds, or who lift bedclothes to make sure where they have put their hands in their sleep. Analyses of these anxiety dreams have made it possible for me to identify these

nocturnal visitors more precisely. In every case the robbers stood for the sleeper's father, whereas the ghosts correspond to female figures in white nightgowns."

DREAMS AS THERAPY

Thus for Freud the motive force behind the dream was the instinctual drives. During the day society's censors are firmly in control. But at night, in the dream, Freud discerned the true self before paradise and innocence were lost. This Freudian image had nothing in common with the prevalent Victorian portrait. That society, or rather its agents—the parents, the nurses, and the teachers—saw their role as constrainers and bridlers. Certain nursery scenes leap vividly to life, though perhaps unintentionally, from Freud's account: "[Undressed children] laugh and jump about and slap themselves, while their mother, or whoever else may be there, reproves them and says, 'Ugh! Shocking! You mustn't ever do that!'"

Victorian culture stressed control and constraint. So did the Iroquois society with its ideal of the autonomous, disciplined warrior. But the realities of living were something else again. The Iroquois and the Viennese needed some relief from the demands of society. In Wallace's terms, both Freudian analysis and the Iroquoian dream rites offered the same "therapeutic strategy" of catharsis. In Iroquois society there were the safe ritual opportunities for wish fulfillment through dreams, by dream-guessing games, and in dream-gratification societies. The Iroquoian theme was freedom, the conviction that frustration of desire was the root of all evil.

Freud, although he also offered catharsis, was ambivalent on this latter theme of freedom. On the one hand he held that the repressed self, the drive barred from consciousness, gave

rise to neuroses. Therapeutically the dream becomes, in Freud's phrase, the "royal road to the unconscious," leading the psychoanalytically trained doctor to the regions responsible for man's troubles. Treatment in part involved a catharsis, a "talking out," and a release into awareness of some of the repressed material and experience from the unconscious. More practically the dream provided immediate help as well: dreaming is "a safety valve," Freud was later to write. On the other hand Freud did not yearn to re-establish the Paradise Lost of childhood. He was, as Philip Rieff has pointed out in his perceptive book, *Freud: The Mind of the Moralist*, a conservative with a European perspective who believed that "to produce wisdom and decency there must be a regulative imposition of culture upon human nature."

There was also some ambivalence in the reception accorded Freud's ideas. *The Interpretation of Dreams* earned him a mere $250 royalties and much calumny from many of his contemporaries. But eventually the literate world went into a Freudian orbit; Freud's ideas irrevocably changed man's way of looking at himself, and at his dreams. With the emergence of modern, psychological man, dreams were never again to be dismissed as the products solely of a cold draft, a hot meal, a damp nightshirt, or tousled bedclothes. The ancient interest in dreams was revived once again. Other theoreticians elaborated Freud's insights or drastically revised them; clinicians attempted to verify them in the laboratory; and a small army of ethnologists took to the field in search of confirming evidence of Freud's theories in the dream life of non-European societies. The following two chapters are an account of some of this post-Freudian interest in dreams.

CHAPTER THREE

After Freud: Dissenters and Dream Makers

Two UFO Dreams · The Wrong Key · Experimental Dreams · Dreaming upon Demand · The Tachistoscope · Subliminal Slides · Tracers on Thought

The story that July day in 1958 had the ingredients to put it on page one in newspapers all over the world. Dr. Carl Gustav Jung, the greatest living psychologist, believed in flying saucers, the unidentified flying objects.

As it turned out, the "news" proved both old and distorted. In July 1954 Jung had given an interview to the Swiss weekly *Die Weltwoche*. In it he remarked about the flying-saucer phenomenon: "Something is seen but one doesn't know what." Four years later the editor of the monthly bulletin of

the Aerial Phenomena Research Organization, issued from the Unidentified Flying Objects Center in Alamogordo, New Mexico, rewrote the interview, treating it as if Jung had made the statement to the organization. "I was quoted as a saucer believer," Jung later recalled in his essay *Flying Saucers*. "I issued a statement to the United Press and gave a true version of my opinion, but this time the wire went dead: Nobody, so far as I know, took any notice of it." For Jung, the story had a moral: "[Since] the behavior of the press is a sort of Gallup test with reference to world opinion, one must draw the conclusion that . . . to believe the UFOs are real suits the general opinion, whereas disbelief is to be discouraged. This creates the impression that there is a tendency all over the world to believe in saucers and to want them to be real."[1]

Why should it be more desirable for saucers to exist than not? Jung asked himself. His answer, in part, was that the UFOs are symbols from an ancient dream language. Behind this answer is the theory of dreams that Jung erected in opposition to the theories of his teacher, Sigmund Freud.

TWO UFO DREAMS

Freud and Jung met in 1907, after corresponding for six years. Jung was thirty-two years old at the time, the son of a clergyman in the Swiss Reformed Church, who had been trained in medicine. The Freud-Jung relationship was that of mentor to pupil. But eventually Jung renounced some of Freud's psychoanalytic approach and developed his own school of analytical psychology. Jung valued the dream even

[1] *Flying Saucers: A Modern Myth of Things Seen in the Skies*, by C. G. Jung. Translated from the German by R. F. C. Hull. New York: Harcourt, Brace & Co., 1959.

more than did Freud. He believed that there are some particularly vivid and significant visions, or "collective" dreams. These dreams, he said, come from the collective unconscious —an all-uniting repository of human experience that transcends the dreamer, space, time, and historical epochs. Each development in man from the primeval night forward, Jung thought, is imprinted in the collective unconscious—just as the human body bears such physical traces of its evolutionary development as fishlike gill arches in the embryo and the vestigial tail bones that form the coccyx. These archaic thoughts survive in dreams and myths ("the dream of the race"). They express themselves in symbols "representing, in visual form, some thought that was not thought consciously, but is merely potentially present in the unconscious, in invisible form, and attains visibility only through the process of becoming conscious."[2]

Freud, according to Jung, found only one archetype—that of incest, the Oedipus motif. But for all Freud's wisdom, he stopped short with this discovery in the mistaken belief that the sexual instinct was predominant. According to Jung, the most important archetypes are not sexual but religious. To illustrate his contention, Jung cites these two UFO dreams by an "educated lady" in his essay on flying saucers:

First dream: I was going down the Champs Elysées in a bus—suddenly the air-raid warning sounded—all the passengers jumped out—I was the last to leave—I tried to get into a house but all the doors with their polished brass knobs were tightly shut—I pressed against the wall of a house and looked up at the sky: instead of the expected bombers I saw

[2] The principles of this school were developed in Jung's books: *Psychology of the Unconscious* (translated by Beatrice M. Henkle. New York: Dodd, Mead and Co., 1924); *Modern Man in Search of a Soul* (translated by W. S. Dell and Cary F. Baynes. New York: Harcourt, Brace & Co., 1933); and *Integration of the Personality* (translated by Stanley M. Dell. New York: Farrar and Rinehart, 1939).

a sort of flying saucer, a metallic sphere shaped like a drop –I had the impression that I was being observed.

Second dream (*about a month later*): I was walking, at night, in the streets of a city. Interplanetary "machines" appeared in the sky–the "machines" looked like large steel cigars. One of the "machines" spotted me and came straight towards me–I did not flee. From the front–it looked like a circular eye, half blue, half white. . . . A room in the hospital–the mere sight of the machine had burnt my face.

The Freudian approach, Jung commented, would turn the UFOs into sexual fantasies. The first dream would become a hysterical anxiety dream; the saucer would be the womb (drop=water; the Greek *hysteros*=the womb). In the second dream the phallic shape of the machine is obvious but, Jung says, superficial. To Jung these dreams are archetypes of a genuine religious experience: the traditional circular eye of God, which, all-seeing, "searches the hearts of men." The saucer, then, is not a new shape but only the latest manifestation of the constantly experienced symbol of totality, of divinity, of wholeness. The UFO is the prehistorical sun wheel, the magic circle, the eye of the Egyptian god Horus, the Biblical Elijah who spies out unrighteousness on earth from above, Plato's world soul, the searing radiance of the Messiah Jesus ("He who is near unto me is near unto the fire"). Because ours is an age of science and space travel, Jung suggested, the religious archetype now takes the form of a technological construction "to avoid the odiousness of a mythological personification." UFOs, in short, used to be called gods.

Are the flying saucers real? Whether or not they actually are otherworldly visitors is beside the point, according to Jung. He believed they should be treated as psychological projections–visions of wholeness in response to a lack of

wholeness. The real point about the UFOs is that so many people claim to see them or want to believe in them. The archetypical circle of the saucer expresses man's overwhelming religious need for wholeness. We look to the heavens for a redeemer, just as man did in that other time of great division, the religious wars of the seventeenth century. Then, thousands of Europeans reported seeing yellow disks flying around the sun and took them for signs their troubles were coming to an end. The UFOs are also a sign. "What can I do to save myself?" Jung's patients asked him. The UFOs in dreams and myths bring the answer: "Become what you have always been, namely the wholeness we have lost in the midst of our civilized, conscious existence . . ."

Jungian man, in summary, is something more than himself in his sleep; the dream is an expression of his godlike collective nature. Freudian man, on the other hand, is something less than himself in sleep; the dream is an expression of his childlike lower nature. Erich Fromm, the New York psychoanalyst and author, concludes that the dream expresses *both* the lower, irrational strivings as well as a higher wisdom and decency that transcends waking thought. Dreams, he wrote in *The Forgotten Language*, show "both the best and the worst in ourselves." Each school has its adherents. But for most psychiatrists, Jung is too mystical. For others, Freud is too narrow, restricting dream motives to the expression of infantile sexual drives at the expense of the whole range of human emotions.

THE WRONG KEY

If theoreticians like Jung felt Freud's dream theory was too narrow, some practicing psychiatrists found his dream-interpretation methods too arbitrary. "Classic" dream inter-

pretation attempted to translate each manifest dream sign into its "true" sign in accordance with a key. This key had the effect of making every object a symbol for either the male or the female genitals. In Emil Gutheil's *The Handbook of Dream Analysis*, for example, symbols for the penis include: inanimate objects such as a fountain pen, a pencil, a key, a hat ("an image of power"); persons such as a dwarf, a soldier, a janitor; the common names John, Dick, Henry; and among animals, squirrels, rats, bulls, birds, a cow's udder. Other phallic symbols are fruit such as bananas or pears, plants, the stalks of flowers, trees, roots, trunks ("the latter signifying erection"), geometric figures that are elongated, and the number 3 ("the three constituent parts of the male genital"). In general, circular objects and containers represent the female; but so do a cage, a stove, an oyster, a cabbage, a window ("an outlet to one's urges"). Sexual intercourse is frequently expressed by acts of contact, Gutheil writes. Thus telephoning, dancing, or eating a meal with a person of the opposite sex may stand for intercourse; body movements and actions, such as riding in a car or on a horse, fishing, plowing, bowling, also symbolize the sexual act.[3] So ubiquitous are these symbols, in fact, that a recent survey of psychoanalytic writings counted 102 symbols for the penis, 95 for the vagina, and 55 for sexual intercourse.

There has been a turn away from such procedures of interpretation. One fresh approach, for example, has been worked out by two psychoanalysts, Edward S. Tauber and Maurice R. Green of the William Alanson White Institute in New York City. Dreams, they believe, contain intuitive insights that transcend logical waking thought. They have suggested to their students—trainees at the institute—that they put this hunchlike quality to work in their practices. Dur-

[3] *The Handbook of Dream Analysis*, by Emil Gutheil. New York: Liveright Publishing Corp., 1951.

ing the conventional psychoanalytic hour, the analyst usually listens as a detached, unemotional observer while the patient recounts his or her dreams. Tauber and Green, however, tell the patients *their* dreams. The following illustration is a dream Tauber had about one of his patients, a young married woman who had been in analysis for a few months. It is taken from Tauber's and Green's *Prelogical Experience.*[4]

The Patient and I are on an island in the Mediterranean. We are walking together . . . it seems to be dusk. The atmosphere has a romantic quality. I am trying to understand something, although nothing has been said . . .

Tauber told this dream to his patient. When she made no comment on it, he remarked spontaneously to her that he felt the "romantic components of her marriage weren't satisfactory." This subject had not come up at all in the earlier sessions. Subsequently she confirmed his dream hunch. Tauber wondered why the hint should have come to him in a dream; he came to the conclusion he had been deliberately avoiding raising questions about the patient's marriage because, with all her other troubles, she had to believe at least her marriage was sound. The dream came to his assistance, Tauber comments, and stopped his "useless philanthropic attitude towards the patient," which had delayed real help.

EXPERIMENTAL DREAMS

Was Freud right? Was Jung? Many modern psychotherapists, as Tauber's comments on the young married woman indicate, prefer to ask: which approach best helps the patients?

[4] *Prelogical Experience. An Inquiry into Dreams and Other Creative Processes,* by Edward S. Tauber and Maurice R. Green. New York: Basic Books, Inc., 1959.

As Jung himself has written: "I need not try to prove that my dream interpretation is correct—that would be a somewhat hopeless undertaking—but must simply help the patient find what it is that activates him." This is, at best, a subjective test. There have been attempts at objective, controlled tests of the dream mechanisms first suggested by Freud. Like the "stomach-ache" school of the nineteenth century, these experimenters sought to demonstrate cause-and-effect relations. But the stimuli they used were more provocative, headier, and more highly charged than Maury's wines and perfumes.

Between 1911 and 1924 Karl Schroetter, Gaston Roffenstein, and M. A. Nachmansohn tested, in some rather dramatic dream experiments, three Freudian ideas: the symbol-making process in dreams, the role of the dream censor, and the sleep-protecting function of the dream. Their work is reported in English translation in the volume *Organization and Pathology of Thought*.[5] All three men used, to some extent, the technique of hypnosis, a still controversial and little understood medical tool. The American Psychiatric Association, in a statement issued in February 1961, still had not resolved the status of hypnosis in medicine. Its official position stated in part: "Unfortunately, so little is known of the nature of the hypnotic state that definitions usually reduce themselves to mere descriptions of the various manifested phenomena. Few reports of controlled experiments into the nature of hypnosis have been published." The results reported by Schroetter, Roffenstein, and Nachmansohn should be viewed in this light.

Schroetter put his subjects into a "deep hypnotic sleep" (which he described as "unconsciousness followed by amnesia") and then gave them "a suggestion to dream." His suggestions were of four types: to dream about physical sen-

[5] *Organization and Pathology of Thought*, edited by David Rapaport. New York: Columbia University Press, 1951

sations such as a headache, toothache, or the urge to urinate; to dream about isolated ideas; to dream about the fulfillment of conscious wishes (such as the desire to stay in Vienna); and, finally, to dream about the fulfillment of tabooed wishes. He also instructed his hypnotized subjects to write down their dreams the next morning. The experiment considered Schroetter's most successful involved Miss E, a twenty-four-year-old pharmacist. Miss E was told:

You will dream that you have homosexual intercourse with your girl friend L. You will forget the suggestion and then dream. (Miss E, Schroetter tells us, is "Aryan," while L is Jewish.)

Dream (*following night*): I sit in a small dirty café holding a tremendous French newspaper. . . . A woman with a strong Yiddish accent asks me twice, "Don't you need anything?" I don't answer . . . she comes a third time . . . I recognize her as my acquaintance. She holds a threadbare suitcase with a sticker on it that reads: "For ladies only!" I leave the café with her and we go through an unfamiliar street. . . . On the way she hangs onto me; I find this unpleasant but suffer it in order not to offend. Before her house she pulls an enormous bunch of keys out of a rag, selects a key and gives it to me: "I trust only you with it; it is the key to this case. You might like to use it. Just watch that my husband doesn't get ahold of it. . . ." She goes into the house, leaving me with the key . . .

This dream as reported, in addition to the obvious references like "For ladies only," contained the classic Freudian symbols: a suitcase (woman), housekey (male member), house (woman). Schroetter concluded that the dream represented homosexual activity in a disguised rather than an explicit form and was a demonstration of how the psychic cen-

sorship prevents direct expression of tabooed ideas. As can be seen from the experiment, it is of critical importance that the subject be utterly naïve. If Miss E had known, read, or heard anything at all of Freud or Freudian theory (or, for that matter, of Schroetter's purpose), then the neatly served-up dream symbols would be suspect. She had to be a *tabula rasa*. Roffenstein, who suspected that Miss E was not altogether innocent, claimed that *he* had the perfectly pure subject in the person of "a twenty-eight-year-old, totally uneducated nursemaid of subaverage intelligence, who grew up and still lives in an entirely uneducated milieu untouched by scientific aspirations." The girl was "mentally healthy" and Roffenstein was sure she had never heard of Freud. He suggested that she dream of five different tabooed sexual activities. The mildest suggestion of the five is reported here.

Suggestion: Dream of intercourse with your father.

Dream: I dreamt about my father, as if he had presented me with a great bag . . . and with it he gave me a large key. It was a very large key. It looked like the key to a house. I had a sad feeling. . . . I opened the bag. A snake jumped right out against my mouth; I shrieked aloud and then I awoke.

The dream seems to speak for itself; Roffenstein concluded that he had thus provided independent and controlled experimental proof of symbol formation in dreams.

DREAMING UPON DEMAND

Nachmansohn's dream experiments, published in 1916, are considered the most thoughtful and carefully controlled of the three. First he tested Freud's notion that dreams protect

sleep. One of his patients was a woman who was plagued by severe headaches caused by organic brain disease; as a result, she was bedridden and could not sleep through the night. Nachmansohn gave her the hypnotic suggestion to dream about her headache when it recurred during the night. To make the dream as pleasant as possible for her, he suggested that she dream she was out of the hospital and teaching school. Her dream:

I was teaching in a home for children. . . . I used the first hour for arithmetic. . . . My head was buzzing and I didn't even know whether the answers were correct. Then, suddenly, I was in the middle of a forest . . . we had nature study. The buzzing in my head did not stop. . . .

The woman, Nachmansohn reported, slept through the night without waking for the first time in months, evidence that the dream was indeed a protector of sleep. Nachmansohn also tested symbol-making in dreams in a somewhat more elaborate manner than either Schroetter or Roffenstein. He gave three women of different backgrounds the identical dream suggestion. Subject 1 (his method of identification) was twenty-four, "very intelligent, an outspoken masochist"; Subject 2 was forty-five, of "Catholic peasant parentage, altogether unread, honest, and without any fantasy"; Subject 3 was thirty-six, "wellborn, intelligent, honest, noble character." Nachmansohn's dream suggestion to each was: "You are a nurse in Amsterdam in the house of a widower. You have an affair with him and you become pregnant. You expect a child."

Subject 1, the masochist, dreamed that a man of about forty "beat me with a piece of wood." Subject 2, the poor Catholic woman, dreamed of a beautiful house, "like in a fairy story," and that she was happily married and pregnant.

Subject 3, who had been having an affair and had real reason to fear pregnancy, dreamed she was on a small boat on the high seas and was seasick.

THE TACHISTOSCOPE

Each man—Schroetter, Roffenstein, Nachmansohn—worked independently of the other. And while their results with hypnotic suggestions tended to support each other, and Freud's ideas, a less ambiguous laboratory tool to test Freudian dream theory was discovered about the same time. This tool was the tachistoscope, a simple, cameralike projector with an ordinary light bulb and a fast shutter that permits the operator to flash a slide on a screen for exceedingly short exposure times. The tachistoscope was used initially during World War I by an Austrian neurologist named Otto Poetzl; after almost four decades of neglect the tachistoscope was rediscovered as a technique for dream research and is now being used in some of the leading psychiatric research centers in the United States. The long neglect is hard to understand, for the Poetzl technique makes possible some ingenious experiments.

Originally, Poetzl, as part of a study on aphasic patients, was investigating the peripheral vision of normal persons. As a phase of his study, he flashed colored slides of everyday street scenes and landscapes on the screen with the tachistoscope for 1/100th of a second (by comparison, it takes 1/25th of a second for the human eye to blink). The observers, as expected, reported seeing only part of the tachistoscopic scenes; but Poetzl noticed that his observers *later* recovered much of the previously unreported parts *in their dreams.* Poetzl speculated that the picture had registered in the brain's visual apparatus but was below the level of awareness. Drs.

Howard Shevrin and Lester Luborsky, who have been studying perception and memory since 1954 at the Menninger Foundation and the University of Pennsylvania, have likened this phenomenon to an exposed film that has not yet been developed.

There is a striking parallel between these tachistoscopic picture images that are later dreamed about and the "indifferent day residues" that Freud identified as the manifest stuff of dreams. Both Freud and Poetzl were aware of these parallels. In Shevrin's and Luborsky's photographic analogy, the dream does its own kind of darkroom processing to develop the exposed but previously unprinted film. The processing is done according to its own laws rather than the laws of the waking state. This finding went a long way toward explaining much of the seeming surface nonsense of dreams. It also suggested how images and other data are recorded unknowingly in the mind and later become available for use in dreams and, perhaps, for other kinds of mental activity, including creative thinking. However, except for a short footnote by Freud in the 1919 edition of *The Interpretation of Dreams*, the Poetzl phenomenon, like the tachistoscope, remained largely unappreciated until 1954.

SUBLIMINAL SLIDES

Then Dr. Charles Fisher, a psychoanalyst at New York's Mount Sinai Hospital on upper Fifth Avenue, revived interest in the tachistoscope when he repeated the original Poetzl experiments. Using eighteen hospital patients and six physicians as subjects, Fisher flashed the same scenic slides on a screen at 1/100th of a second. Each subject was asked to draw what he had seen; then each was requested to record any of his dreams that night; finally, on the following day,

he was asked to describe and draw his dreams. The experiments confirmed Poetzl's observation that perceptions of which one is unaware can nevertheless enter one's dreams. Fisher then extended the tachistoscope experiments in a number of ways. Poetzl had used only picture slides; Fisher exposed a slide with three words and a number. The words and the number were arranged as follows in the slide:

EXIT
246 MINK
STAR

The exposure time was 1/200th of a second. One subject, a physician, said he recognized some letters but could not identify any of them. That night he had a dream with the chief association: "8 automobile accidents." The number 8, possibly but not conclusively, Fisher reported in the *Journal of the American Psychoanalytic Association* for July 1954, could have been the continuation of the arithmetical progression 2–4–6 to 8. On the next night the doctor-subject had a dream which centered about a "guitar." When he was shown the slide non-tachistoscopically so that he could read it at leisure, the physician suggested he might have taken the "6" to use as a "G," the "it" from "exit," and the "tar" from "star" to compose the word "gittar."

Fisher described in the same paper how he served as his own guinea pig. He did this several times, taking the needed precautions to guarantee he would not know in advance what slides would be flashed by the operator. "I . . . can affirm the feeling of recognition and surprise when the picture is re-examined [at leisure] and certain structures are spotted. The subjective experience of tachistoscopic dreaming is very impressive. *When one makes drawings of the dream scenes they seem to come out of the pencil, almost*

like automatic writing—the pencil draws by itself. Along with the automatic quality there is a compulsive need to put in or omit certain items."

Why does the dream take up these unimportant and unnoticed details of waking life? Why does the dreaming mind "develop" more of the picture than the waking mind? Why the automatic, compulsive feeling? Freud's original, pre-Poetzl observation was that the unconscious, latent wish "prefers to weave its connections around" events, impressions, words, and ideas that are "indifferent" because these can serve as good "covers" for the wish—that is, allow it to slip past the censor and achieve gratification in the dream. If this is true, Fisher reasoned, then the "undeveloped" part of the tachistoscopic slide should show up in the dream as an image related to the wish-fulfilling function of dreaming. To check this idea, Fisher in 1959 embarked on some rather staggering experiments. Again using the tachistoscope, he flashed a slide with *two* images side by side on the screen. One image was a vase with a swastika on it; the other image was of a large, uncoiled snake (Fig. 1). Both objects are

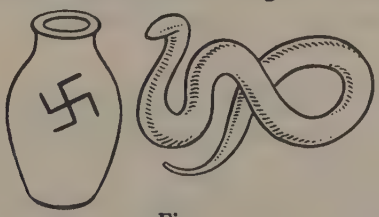


Fig. 1

classic Freudian sexual symbols. In addition the swastika, while it might be thought of as an American Indian decoration, has more immediate and highly charged connotations. Fisher showed the slide to eight male residents and physicians at Mount Sinai, two female patients, and an actor (the latter a paid volunteer). In seven of the experiments the snake was made *subliminal* and the swastika-decorated vase *supraliminal*

—that is, the snake was drawn with light pencil marks so that it would be *below* the threshold of conscious awareness during the brief 1/200th-of-a-second exposure time, while the vase was drawn in heavy pencil lines so that it was *above* threshold and recognizable to persons of average eyesight. In four experiments Fisher reversed the procedure and made the snake supraliminal and the vase subliminal. All the subjects were able to recognize the supraliminal images after one or two exposures *without* recognizing the subliminal image. Subject A, a male and younger than Fisher, had the following dream after exposure to the slide on which the snake was subliminal and the vase supraliminal:

I was in a totalitarian prison camp in a room which they were trying to wire so they could listen in. There was a red-headed guy sitting in a chair. His name was Fisher. His arms were bare; they were shortish and bound down on the arms of the chair with Scotch tape. He did not seem too frightened. . . . I said to him, "I'm resigning tomorrow from the concentration camp. Now I'm going to take up my bullwhip," and I made a threatening gesture at him.

The next day Subject A made a drawing depicting himself threatening "Fisher" (who, he said, was not the investigator but an old friend) with a bullwhip. The arm that holds the whip has large biceps (Fig. 2). Subject A commented

Fig. 2

that the whip "was black and made of some kind of living stuff like catgut . . . or snake hide." Dr. Fisher interpreted the dream this way: The dream expressed the dreamer's unconscious, aggressive wish to reverse roles with the experimenter and change his status from that of the "exploited one." The dreamer gives himself strength and potency (the big biceps); Fisher in the dream ("an extremely thin disguise for me," he commented), on the other hand, has weak arms that can be held by Scotch tape.

Subject A's dream, and the majority of the experiments in this group, which were described in the May 1960 issue of the *American Journal of Psychiatry*, appear to bear out Fisher's hypothesis. Both the snake and the vase, when *subliminally* projected, apparently "resonated" (Fisher's word) with the deepest level of repressed memories—subliminal snake becomes bullwhip becomes instrument of power in the hands of the younger man. At the same time the *supraliminal* perceptions seemed to resonate with the higher levels of conscious memory, and the subjects produced "direct, waking derivatives" of the swastika image, such as the totalitarian concentration camps and the prisons.

TRACERS ON THOUGHT

Fisher regards his tachistoscope work as exploratory. The Poetzl technique, in fact, is just now becoming an important tool of personality research. At the Menninger Foundation research department in Topeka, Kansas, and at the University of Pennsylvania's department of psychiatry, Shevrin and Luborsky are trying to determine whether Freud's notions of repression can explain why some people more than others forget fleeting impressions. Looking beyond the special role that preconscious perception plays in dreams, they are now concerned with the influence of incidental and subliminal

impressions on daytime thought. The behavioral scientists, Shevrin and Luborsky point out, have long envied the way that the physical scientists experimentally manipulate atoms or enzymes or energy. Such control would seem to be an unattainable goal for a science whose subject matter is man. But the tachistoscope is enabling psychologists to put a "tracer" on perceptions in the same way that radioactive tracers are used by physicists to study the structure of matter. In Shevrin's vivid phrase: "We can now take a cross-sectional sample of perception from the moment of wakeful, hardheaded appreciation of reality to the highly personal, memory-haunted transformation of the reality in dreams."[6]

As a postscript to the Poetzl story, it should be pointed out that psychology is not alone in its rediscovery of the tachistoscope. In 1956, a Manhattan firm that called itself Subliminal Projection Co., Inc., unleashed tachistoscopic messages for six weeks on the unsuspecting patrons of a New Jersey movie theater. The messages, flashed at 1/3000th of a second during the showing of the regular features, said simply: "Coca-Cola" and "Eat Popcorn." According to Subliminal's James M. Vicary, "Coke" sales in the theater lobby increased 18 per cent and popcorn consumption went up 57 per cent. A triumphant news conference was held. His silent sales pitch, he declared, offered the television-viewing public, in particular, a glorious utopia of "fewer interruptions for sponsor messages and added entertainment time." But he hastened to assure any apprehensive consumers that invisible TV advertising could never make a viewer buy something he didn't consciously want: "Subliminal beer ads would have no effect on non-drinkers."

[6] Tracer studies of perception, as well as the repetition of the Poetzl phenomenon, have been described by Shevrin and Luborsky in the *Journal of Abnormal and Social Psychology* for May 1958; in the *Bulletin of the Menninger Clinic*, May 1956; in the *Menninger Foundation Annual Report*, 1958–59; and in the *Menninger Foundation Report of Progress*, 1959–60.

CHAPTER FOUR

After Freud: Dream Collectors

Kinsey Reports on Dreams · What People Dream about: 10,000 Examples · The American Dream · The World Dream: 1. The Search for Symbols; 2. The Search for Functions; 3. The Search for Unity

From their Freudian beginnings at the turn of the century, both clinical and experimental research into the psychology of dreams have had a distinctly European accent. Even when the center of dream research in later years gradually shifted to the United States, European developments were transplanted in whole or in part. This does not mean that American psychologists of an earlier day had nothing to say about dreaming. It was a case of different emphasis. From the traditional American point of view the European dream work was, in the words of psychologist Calvin Hall,

"long on theory and short on observation." The first American dream research, in contrast to the introspective, Germanic, and nebulous (so the Americans thought) speculations of the Europeans, followed a more statistical approach.

The first systematic American dream research was undertaken in 1892 by twenty-five-year-old Mary Whiton Calkins, a *Mayflower* descendant, a Smith College alumna, a Harvard graduate student (she took her Ph.D. orals under William James, but the Harvard Corporation refused to grant a degree to a woman), and a Wellesley College instructor. Miss Calkins did most of her dream work at her parents' home in Newton, Massachusetts, traveling by trolley and train to Wellesley. She used an alarm clock to awaken herself throughout the night and had a pencil and pad near her night candle to record her data as soon as possible after waking. Over a period of weeks she and a male colleague collected 375 dreams, which Miss Calkins classified according to tone and content. Three out of four dreams, she reported, were unpleasant; 90 per cent could be traced to current events in the dreamers' waking lives. Professor Madison Bentley of the University of Illinois furthered Miss Calkins' efforts to get as close as possible to the actual "live" dream. His "Study of Dreams" appeared in *The American Journal of Psychology* in 1915 with the charming subtitle, "A Method Adapted to the Seminary." Bentley enlisted five seminary students for a two-week-long experiment. Each dreamer was supplied with a standard form to record his dreams, candles, matches, pencil and an alarm clock that had been set according to a schedule unknown to the dreamer. When the alarm rang, the subject was to take "an introspective attitude and to wait passively for the resurgence or the *Abklingen* of the dream." The experiment indicated that dreams occur regularly throughout the night. After one hour of sleep the awakened students were unable to recall any dreams; but

awakenings between one and two hours and two and three hours produced one dream each; the third to the fourth hour produced four dreams. The two highest periods were between the fourth and fifth hour of sleep and between the sixth and seventh hour; twelve dreams were recalled in each period.

No group was too small or too specialized for the statistics collectors. Professor Joseph Jastrow in 1888 investigated the dreams of a congenitally blind and deaf woman; people who entered into her dreams, he found, communicated with her by touch. A psychoanalyst, M. H. Erickson, observed that dreams may occur in an eight-month-old infant. The nightmares of children were studied; the most frequent contents reported were animals, death, murder, and being chased. The relationship between I.Q. and dreaming was investigated; none could be discerned. A study of 3394 elementary school pupils in Illinois made in 1939, indicated that girls reported more dreams than boys. The dreams of fifty convicts were collected; the most frequent topic was returning home. So were 200 dreams from twelve schizophrenics; no distinctive pattern related to their mental disorder seemed to emerge (however, see page 106, Chapter Five). The dreams of a woman being given morphine to ease the pain of childbirth were described in 1944 in *The Psychoanalytic Review*. She dreamed in color that she was "being taken by friends to see an illuminated Japanese garden . . . lakes and gardens, paths, and flower beds . . ." There also have been studies of the dreams of a lion hunter, a constitutional psychopath, a transvestite, and a paraplegic. In the 1940s Dr. Ancel Keys collected the dreams of thirty-six fasting men taking part in a University of Minnesota starvation experiment; the fasters showed a decline in the number of sex dreams.

KINSEY REPORTS ON DREAMS

Sex in dreams, as would be expected, was given close but cautious attention by the early statistics collectors. Not until Dr. Alfred Kinsey's studies was the statistical approach applied on a large-scale sampling basis in an effort to reflect the behavior patterns of the entire United States adult population. Kinsey and his staff interviewed some 5300 American males and 5940 females and reported their findings in two volumes, *Sexual Behavior in the Human Male* (1948) and *Sexual Behavior in the Human Female* (1953).[1]

In the male, Kinsey found, there were many reported sex dreams that did not end in orgasm; on the other hand some men who regularly had nocturnal emissions told the interviewers that they were unable to recall an accompanying dream. Kinsey was inclined to believe that no orgasms could occur during sleep without, in his phrase, "psychic accompaniment." The dreamers in the latter group, he concluded, had most likely forgotten their dreams. (The notion that nighttime orgasms occur in dreams seems a reasonable assumption backed by common usage: most American males speak of "wet dreams" rather than of nocturnal emissions.)

According to Kinsey, 83 per cent of all males reported having wet dreams at some time in their lives. There was considerable variation among these men. Some reported experiencing orgasms and awakening two or three times in the course of one night's sleep. Others reported only a few such experiences in their entire lives. The wet-dream average for

[1] *Sexual Behavior in the Human Male*, by Alfred C. Kinsey, Wardell B. Pomeroy, and Clyde E. Martin. Philadelphia and London: W. B. Saunders Co., 1948. *Sexual Behavior in the Human Female*, by Kinsey, Pomeroy, Martin, and Paul H. Gebhard. Philadelphia and London: W. B. Saunders Co., 1953.

men in their teens and twenties was almost once a month. Religious, geographical, and occupational differences had little effect on the reported frequency of wet dreams. But there was a direct correlation between the amount of education and the frequency of emissions: the college-educated had the highest frequency; males who never went beyond grade school, the lowest. Kinsey concluded from this that wet dreams were related to "the imaginative capacities of the individual." In summary, this picture of the typical male wet-dream experience emerged from Kinsey's case histories: the dream often involves persons who are obscure or unidentifiable; the actors are about to make sexual contact or to engage in actual coitus or other relations; sometimes the dreamer is a participant, sometimes he only observes. The dream activity tends to lag behind the actual experience of orgasm; when the dreamer wakes to find himself having an emission, often he has not reached that point in his dream.

When Kinsey took up the subject of nocturnal sex dreams in women, he not only had the male data available for comparison, but knew what additional factors to seek. Historically, Kinsey found that there had been little previous study of female wet dreams, apparently because it had been assumed that: (1) women didn't have any; (2) if they had, the experiences would not be tangible and recognizable because of the female physiology, or (3) in any event, most women wouldn't admit their experiences to an interviewer. Kinsey found that none of these presumptions was correct. Women had such dreams; they were accompanied by muscular and secretory evidence of orgasm; and the episodes were reported openly to Kinsey's interviewers. Comparatively, Kinsey found women had fewer dreams ending in orgasm than did men. By age forty-five, a cumulative 37 per cent of the 5940 female interviewees reported they had

wet dreams at one time or another in their lives. The frequencies for these women compared to the men were also lower, averaging about three or four wet dreams a year. Of the entire sample only seven or eight women, all of them over thirty, averaged one wet dream a week. Ninety-nine out of 100 times the dream that accompanied the experience was remembered.

The typical female wet dream, like the male's, featured partners who were usually obscure or unidentifiable; the dreamer was a combined observer-participant, and the dream episode a reflection of some experience the dreamer had actually had. But some 13 per cent of the female wet dreamers had dreams that went beyond their actual experience. As with the male, the female wet-dream frequencies reflected little or no variation for geographical or occupational reasons; but the educational factor, so prominent a differentiator in the male record, showed *no* effect on female frequencies. Nor did the age of the dreamer, which surprised Kinsey; he had expected that the "liberated" generations of women born after 1920 would report rates higher than their grandmothers. As for religion, Kinsey found that the occurrence and frequency of wet dreams among women was not affected by affiliation—that is, whether a woman was Protestant, Catholic, or Jewish. He did find a correlation, however, between wet dreams and the degree of religious devotion. "Fewer of the women who were active or devout religiously had dreamed to the point of orgasm," he noted, "perhaps because they had had the smallest amount of overt sexual experience about which they could dream." In this connection Kinsey concluded that wet dreams are one of the best measures of a female's "intrinsic sexuality . . . sexual interests and . . . capacities."

WHAT PEOPLE DREAM ABOUT: 10,000 EXAMPLES

By far the largest, most recent, and in many ways the best quantitative survey of the American Dream was made by Professor Calvin S. Hall. Convinced that the psychoanalytic case studies of dreaming were unrepresentative, Hall set out in the mid-1940s to find what "essentially normal" people dream about. At the time he was a professor of psychology at Western Reserve University in Cleveland, and his students willingly served as dream collectors. Hall prepared special coded forms for them to use. "You are being asked to participate in a scientific investigation of dreams," the forms read. "Write down your dream in as complete detail as you are able to. . . . Do not abbreviate the dream. Report it as fully as you can recall it. . . . Think about its meaning and write down your explanation. . . ." The dreamer was encouraged to free-associate ("let your mind wander in order to find the meaning of the dream").

In all, Hall and his students collected some 10,000 dreams. The stuff of dreams, he reported in his book *The Meaning of Dreams*, is the intimate, immediate concern of men.[2] For example, at the time of the first atomic explosion over Hiroshima in 1945, Hall was collecting dreams daily from his students; yet, he reported, the cataclysmic event failed to appear in a single dream. "All of the happenings that appear in the newspapers and become major topics of conversation among people," Hall noted, "are pretty largely ignored in dreams. Businessmen ordinarily do not dream about their business affairs, factory workers do not dream about their

[2] *The Meaning of Dreams*, by Calvin S. Hall. New York: Harper & Brothers, 1953.

jobs, artists do not dream about paintings, students do not dream about studying, and housewives do not dream about household activities."

What, then, Hall asks, is there left to dream about? His answer is: "The whole world of the personal, the intimate, the emotional, and the conflictful; and it is this world of ideas out of which dreams are formed. A dream is a personal document, a letter to oneself. It is not a newspaper story or a magazine article."

THE AMERICAN DREAM

Another figure of speech might have been that dreams are plays and that asleep, every man is his own playwright. When Hall classified his collection of dream material statistically, he found that the five best categories to use were *setting*, *cast of characters*, *plot* (in terms of action and interaction), *emotions*, and *color*.

Setting: Most dreams were set in familiar or vaguely familiar places, although in a few (one out of twenty), the dreamer was unaware of the setting. By far the largest proportion, about a third, were set in rooms of a house. Some 15 per cent of the dreamers dreamed of being in a conveyance —mostly cars, although planes, buses, and boats appeared, too; while another 10 per cent found themselves in settings allied with conveyances—streets, roads, train and bus stations. Amusement parks, dances, and parties appeared in one out of ten dreams, while the familiar setting of office or factory was rarely used. Rural and out-of-door scenes occurred about 10 per cent of the time.

Characters: The cast almost always included the dreamer himself. About 15 per cent of the time he was alone on the

stage; in the remainder, the typical number of characters was three. Family members appeared most frequently. Generally children dreamed of their parents and parents dreamed of their children; husbands dreamed of their wives and wives dreamed of their husbands. "People who enter our dreams," Hall commented, "are those with whom we are emotionally involved. If you want to know who is dreaming of you, consult your own dreams." Men dreamed more often about male friends; women about both sexes equally. Hall offered a theory for this: a man's relations with other men are more likely to be unstable than his relations with women, while women have an equal amount of conflict with both sexes. About four out of ten dream characters were strangers.

Action: Contrary to Freud's statistics of "typical" dreams, falling dreams, flying dreams, and floating dreams did not occur often. But about a third of dream actions were familiar body movements like walking, riding, jumping. What Hall called passive activities—sitting, watching, talking—occupied about a quarter of the dreams; other commonplace activities, like buying and selling, eating and drinking, appeared infrequently. Women had far more passive dreams, by Hall's definition, than men.

Emotions: Hall reported that "unpleasant dreams were more numerous than pleasant ones, and as we grow older, the proportion of unpleasant dreams increases." Fear was more common than anger; sadness more common than happiness. "Dreaming, on the whole," he wrote, "is not a pleasant pastime." Erotic elements appeared in about half of all dreams. Hall suggested that they may not have been reported as frequently as they appeared because of reticence on the part of the dreamers in his surveys.

Color: About one in every three dreamers reported he had technicolor dreams in whole or in part. But Hall could

find no special significance in them when he compared color dreams with black-and-white dreams. Nor could he find any relationship between certain colors like red or blue and their use in the dream. He concluded that "color . . . is merely an embellishment on the dream and does not signify anything in itself."

Mammoth as his undertaking was, Hall regards his findings as suggestive of still further work. In 1957, Hall—and the dream-collection project—moved to Syracuse University. Currently he has plans for a long-range project to compare the American Dream with British, French, and Scandinavian dream patterns. In addition he provides a brisk service in dream statistics (a San Francisco psychiatrist recently wrote, "Please let me see 200 female dream series . . ."), and the material continues to yield valuable dividends. In one study Roland Cook, a Western Reserve University graduate student, compared the characters that appeared in 400 dreams gathered from 400 different college students in Hall's collection with the characters that appeared in 400 dreams recorded from one Negro epileptic patient in a Cleveland Veterans' Administration hospital. These characters were analyzed according to their age, sex, and relationship to the dreamer. Family figures appeared in the patient's dreams somewhat more frequently than they did in the dreams of the college students (the patient had a large family and was particularly devoted to his mother, Cook explains). Non-family figures, however, appeared with the same frequency in both groups. "What everybody dreams about at any one time is what one person dreams about over a long period of time," Cook commented. Or, as Hall told an interviewer recently, "We hear a lot about the differences between people, but the similarities are much more striking."

THE WORLD DREAM

The same thought about the "psychic unity" of mankind beneath the costume of cultural circumstance has, of course, occurred to a number of people. Jung said there were collective dreams that all mankind shared; Freudian theory held that a uniform kind of mental activity, *i.e.*, wish fulfillment, would be revealed in dreams whenever the individual's egoistic strivings were opposed by the group's social strictures. If these ideas are true, then the dreams of men living in groups everywhere—primitive as well as civilized, non-white as well as European—should use the same symbols, serve the same functions, and disclose the same universal themes. Inspired variously by Freud, Jung, and the new interest in dreams, Western anthropologists set out into the field in search of dream narratives.

1. THE SEARCH FOR SYMBOLS

The results of these forays have been somewhat equivocal as far as dream symbolism is concerned. In 1923, Professor C. G. Seligman, president of the Royal Anthropological Institute, London, described two Asiatic peoples who had "loss-of-tooth" dreams, one of the typical dreams on Freud's list (see page 54, Chapter Two). Seligman asked his colleagues to hunt for more of these typical dreams. Responding to his appeal, A. G. O. Hodgson found loss-of-tooth dreams among the Negro tribes of the Yao, Ngone, Nyanga, and Chewa in the Dowa district of Nyasaland, Central Africa. G. W. Hatchell found them among the Urwira of Tanganyika, and J. H. Driberg among the Didinga

of Southeast Sudan (where the dream was interpreted to mean a successful love affair at the next tribal dance, rather than the castration anxiety Freud ascribed to it).

More recently a Freudian-oriented English anthropologist named Jackson S. Lincoln found Oedipus-motivated dreams among the Navaho and the Kwakiutl Indians of North America. He reported this dream of an "overwhelming fixation on the mother," expressed by a Junkun man of Nigeria:

A Junkun man said that he had been pestered for months with the dream that he was going up the Benue in a steamer with his mother. He enjoyed the sensation at first, but soon grew tired and finally horror-stricken as the boat steamed on . . .

The Naga of Assam and the African Ashanti, Lincoln also reported, actually dismissed the surface of the dream and looked for such symbols. For example, among the Ashanti, to dream that a hunter has killed an elephant means that some chief is going to die. The elephant, Lincoln points out, is commonly a symbol of the king or of great power and strength among African primitives.[3]

On the other hand, no compelling evidence of universal dream symbols has appeared in the remarkable collection of American Hopi Indian dreams gathered over the past twenty years by Dorothy Eggan of Chicago, a Fellow of the American Anthropological Association. These have been published in the *American Anthropologist* as well as in other journals. Mrs. Eggan, in fact, has cautioned against oversimplified dream interpretations unrelated to the dreamer's everyday *milieu*. For example, a nervous Hopi mother frequently reported a short, disturbing dream about dark, canyonlike or boxlike passages.

[3] *The Dream in Primitive Cultures*, by Jackson Steward Lincoln. Baltimore: The Williams & Wilkins Co., 1935.

The orthodox interpretation of this dream would make the passages a womb symbol associated with sexual anxiety. But, Mrs. Eggan points out, it so happens that the woman lived in a canyon-dessicated country and before that had lived in a Hopi village alongside the Grand Canyon, "where she was constantly and quite properly afraid that her small, active son would fall into it."

2. *THE SEARCH FOR FUNCTION*

The Freudian view of dreaming as a "safety valve" has fared much better. In her studies of the Hopi, Dorothy Eggan reached similar conclusions. In one of the most intensive studies of one individual's dream world ever conducted, Mrs. Eggan has collected some 600 dreams from the "Sun Chief," Don C. Talayesva. According to Mrs. Eggan, Talayesva is an intelligent, sensitive, and introspective individual, a pariah keenly aware of his difficulties with his own people and—one of the major sources of conflict in his life—an Indian who identifies with *bahanas*, or whites. Mrs. Eggan made a chart of 254 of Talayesva's dreams (collected over a six-year period), breaking each down into such dream categories as "security support," "persecution and conflict," "physical hazard," "symbols," "sexual activities," "repeated themes," and "dreamer's reaction to dream."

The dream chart showed a consistent "story line," each dream making the preceding one more intelligible. (The value of such dreams in series for clues to dream understanding will be considered in Chapter Nine.) It also showed Talayesva was an extremely anxious man: there were 169 elements of conflict in his dreams—conflicts with Hopi, with whites, with Navahos, and other Indians. More significantly there were 260 elements of "security support": dreams of being strong, wise, or brave; dreams of bolstering gestures

from whites ("My rich white friend Sachs drives up in a limousine . . . says . . . 'I like to be with you' . . ."); such miscellaneous dreams as being picked as "special man" for the *kachina* ceremonial rain dances. In many of his dreams these elements of security support were dominant. Mrs. Eggan believes this is general evidence of the "mental therapy" function of dreams among the Hopi—an "emotional release through fantasy at night (which) frequently enables an individual to live with himself more easily through the day." (Compare this formulation with Freud's original statement: "the dream is a safety valve"; and Wallace's: "the Iroquois dreams served as an escape valve.")

The following Hopi dream illustrates Mrs. Eggan's point. The dreamer, *not* Talayesva, is a coward whose dreams constantly make him a hero.

The Dream: The dreamer goes hunting with some white men and secures several deer. He takes a load of venison to a clan relative who is an old war chief in another village. . . . The old chief invites him to replace a man, now ill, who was to lead a religious dance. After the dance, the dreamer is highly praised for his performance by three men: the old war chief, the sick dance leader, and the leader's brother. . . . A runner tells these men that the village is about to be destroyed by enemies. The three men are in a panic . . . but the dreamer . . . rebuking their cowardice, says, "I'm only a common man but I can stand on my feet and fight. Stand on your feet and fight like men!! . . ."

When the dreamer awakened from this dream he was sweating; he told Mrs. Eggan, "It wasn't a very good dream." She comments: "Nor was it, but it would have been far worse if his waking mind had remembered the dream thoughts which had helped to construct the dream. The

facts are these: some thirty years before this dream occurred, the dreamer was a candidate for tribal initiation into manhood. He was afraid of this initiation, and the old war chief of this dream was prominent among those who forced him into it. One requirement for tribal initiation was the killing of a large number of rabbits. Being an incredibly poor hunter, the dreamer failed to get even one rabbit after hunting for two days. The sick dance leader . . . and the leader's brother—who with the war chief became *three incompetent cowards in this dream thirty years later*—patted the neophyte on the back in a condescending manner and offered to hunt for him. They secured forty rabbits for him in one day, which allowed the initiation to proceed. The entire dream handles this old hurt in a healing manner: the dreamer hunts with white men, which gives him status in his own eyes; he returns quantities of venison for the lowly rabbits of his boyhood; and he angrily shames the cowardice of all three men who contributed to his former humiliation." Mrs. Eggan also uses this example of "protective amnesia" to explain why some people forget dreams or recall only blurred versions of their dreams. (See Chapter Six.)

More support for the mental-therapy function of dreams comes from studies made by anthropologist Marie Reay of the Kuma of New Guinea. All adult Kuma males are regularly awakened by a nightmarish dream. In this dream the dreamer "eats some pork and enjoys it, but people tell him . . . that it is not pork, but human flesh that he has eaten. The dreamer is afraid, but he has already eaten the meat and he can do nothing . . . he wakes up when he can no longer bear the fear and remorse . . ." The meaning becomes clear against the background of the Kuma's forbidding environment, which forces all adult males into close and constant co-operation to survive. But the men spontaneously expressed their resentment of this forced co-operation by telling

their interviewers they would rather "act like wild pigs" and physically grab whatever food they wanted. Their most prized delicacy, it so happens, is pork, which because of the relative rarity of pigs must be shared ritually with other clansmen. The Kuma know cannibalism is practiced in far-off places and they attribute this to the work of witches; Kumas are accused of witchcraft if their behavior is considered "anti-clan." Thus the dream of eating pork starts off pleasantly enough as a simple expression of one waking desire. But soon the sweetness evaporates and the dream turns into a sickening nightmare. And the Kuma name for their dream is *wur kum banz*, which translates into "sweet witchcraft while you sleep," or, more freely, "sugar-coated evil" —a term Freud himself would find hard to improve upon.

Ethnologists have also searched for "non-repressive" societies, on the theory that there would be less need to dream. The Polish-born anthropologist Bronislaw Malinowski (1884–1942) thought he had found, among the Melanesians of the Trobriand Islands in the southwest Pacific, a social order in which "sex is in no way restricted."[4] Therefore, Malinowski reasoned, there should have been little dreaming going on and little interest in the dreams that were recalled. His interviews with the natives, however, left the problem in the air. There were few "free" or spontaneous dreams of any sort. But the natives reported "official" dreams with standard plots dictated by tradition. One such dream, for example, was to be dreamed by the leader of a fishing expedition and was to include information on the expected weather, the places where shoals might appear, and the best date for sailing. In another "official" dream, this one dreamed by husbands, a woman (not his wife) visits the dreamer and has

[4] *The Sexual Life of Savages in Northwestern Melanesia. An ethnographic account of courtship, marriage and family life among the natives of the Trobriand Islands, British New Guinea,* by Bronislaw Malinowski. New York: Halycon House, 1929.

intercourse with him. Malinowski writes: "This he will conceal from his wife but he will try to follow up the dream actively in real life and initiate an intrigue with the woman. For the dream means that she who has visited him has performed love magic and that she desires him." The fact that the dreamer conceals the dream adventure from his wife would indicate Melanesian society was not as permissive as Malinowski believed.

3. *THE SEARCH FOR UNITY*

The most comprehensive search to date for common themes in a wide variety of dreamer groups is being conducted by Professor David Schneider of the University of Chicago's department of anthropology. Schneider's interest in primitive dreams dates from his M.A. thesis in 1940. Since then he has hunted through the ethnographic literature for reliable, firsthand dream accounts. By the winter of 1960 he had almost 2200 dreams from seventy different societies throughout the world. These have been broken down into two major divisions: collections where there are a good number of dreams from one society—at least twenty-five different dreams from ten adult dreamers constitute a "fair" sample—and collections where there are not enough dreams or there are too many dreams from one dreamer to be representative. The "fair" samples now consist of men and women dreamers of fourteen groups, twelve of them non-European.

GROUP	LOCATION	NUMBER OF DREAMERS
Yir Yiront	(Australia)	54
Alor	(Dutch East Indies)	8*
Tinguian	(Luzon, Philippines)	51

GROUP	LOCATION	NUMBER OF DREAMERS
Hopi	(American Indian)	24
Ifaluk	(Micronesian Islands)	55
Baiga	(India)	39
Navaho	(American Indian)	30
Kwakiutl	(American Indian)	52
Trukese	(Truk Island)	16
Buka	(Solomon Islands)	38
Hopi	(American Indian)	13
Kiwai	(Australia)	26
Students	(U. S.)	401+
Patients	(U. S.)	454°

Schneider's first step was to get these dreams onto coded cards for IBM computer processing. A typical dream report, is entered on 5- by 7-inch index cards and kept in a blue stationer's box. The first IBM search was for frequency of themes in the dream content. Schneider chose three categories: death dreams, coitus dreams, and aggression dreams. "These are the universal themes, the constants of human life," he explained recently in an interview. Other entries of elements that have been coded and run through the computer include dream style, time (past, present, future), logical coherence, principal figure(s), and a "present-absent" mark for such items as color, sound, travel by conveyance, laughter, stealing and dreams of flying, falling, and loss of tooth.

The study, which Schneider expects to complete in 1964, is not a world-wide dream sample in any sense—no African dreams are represented, for example. Still, some highly intriguing patterns already have emerged. (1) In each of the fourteen societies studied, Schneider has found far more aggressive dreams than sexual dreams. In some groups, such as the Alor, Buka, and Kiwai, the ration of aggressive to

* Close enough to qualify as "fair"
+ College subjects from Calvin Hall's collection
° Cases reported in the *Psychoanalytic Quarterly*

coitus dreams is as high as 10 and 20 to 1; in other groups, such as the American psychoanalytic patients, the ratio is a little less than three to one. (2) The Navaho reported no coitus dreams, but the Baiga had many. (3) Yir Yiront women had extraordinary pale, shallow, and brief dreams compared with Yir Yiront men. (4) On the Pacific island of Truk there is a Great Trukese Dream: the natives regularly dream they are falling out of coconut trees. Yet Schneider was unable to uncover any similar dreams among other coconut-tree-climbing societies.

Schneider offered an interviewer this provisional explanation of these four patterns. If dreams were merely a reflection of instinctual drives, as orthodox psychoanalysts maintain, then there would be *no* distinct cultural patterns of dreaming from group to group. The first small conclusions from the study indicate that the similarities within groups are greater than the similarities between groups. "The next step," Schneider says, "is to find the cultural basis for these different patterns. The need to dream is the need to deal with problems. Our concern is to find what kinds of problems people have."

What does this evidence, gathered to date from the field, tell us about the Great World Dream? The best summary might be this: there is some evidence that dreams serve the same "safety-valve" function in primitive and advanced societies; there is slight evidence of such typically Freudian sexual themes as flying, falling, loss-of-tooth dreams; there is firmer evidence, on the other hand, for cultural patterns of dreaming; the evidence for universal dream symbols is inconclusive.

For all the diversity of technique, circumstance, and purpose, the dreams gathered by the analyst in Zurich, the interviewer in Ohio, and the ethnographer in New Guinea have one important feature in common: they are all accounts

of what people *say* they dream about. These versions may have been edited by the reticent; they may have been completely rewritten by the braggart; they may be out of focus, like a defective TV picture, even for the honest informant. "This has ever been the case and probably always will be," Calvin Hall remarked in 1951, when he published the first report on his collection of 10,000 dreams in *Scientific American*. "No one has a method of transcribing a dream while it is being dreamed."

Within a year Hall's statement was no longer true.

CHAPTER FIVE

From the Eyes of Babes

Life in Monmouth Cave · The EEG: Listening in on the Brain · The REMs · A Night in Abbott Hall · The Dream Cycle · The Stages of Sleep · The Theater of the Mind

As frequently happens in scientific research, the great passkey to the inner world of dreams was discovered quite by accident. The inadvertent hero was a nameless Chicago infant, asleep in his crib one day in 1952. The real hero was Professor Nathaniel Kleitman, the distinguished University of Chicago physiologist. At the time he and one of his graduate students, Eugene Aserinsky, were studying the sleep habits of infants during the first six months of life. Professor Kleitman has been called, with justice, the world's leading authority on sleep. His research, among the most imaginative, yet meticulous, work in modern science, pro-

vided the essential physiological framework for understanding sleep and dreams.

When Kleitman started his sleep studies in the early 1920s, man's knowledge of the one third of his life he spends asleep had not progressed much beyond that of the ancients. There had been some speculations about the existence of a "sleep center" in the brain, some suggestions that sleep might be related to chemical changes in the blood, and a large amount of folklore, which held, for example, that some people "sleep like logs," that "one hour of sleep before midnight is worth two hours after midnight," and that "dreamless sleep is the best kind." Thanks to Kleitman and his associates, all of the above has been shown to be untrue.[1]

Kleitman began his work by asking what he called the "conventional" questions: why do we sleep? why eight hours? His work was carried out along less conventional lines: he studied sleep by staying awake and observing what prolonged sleep deprivation did to him. On one occasion Kleitman, a gentle, soft-spoken man of less than medium height and build, stayed awake for 180 hours, more than seven days and nights. Or, more accurately, a colleague has pointed out, he was kept awake. A crew of watchers played cards with him, walked him about, gave him stimulants and, ultimately, had to slap him to keep him from going to sleep.

During this and similar experiments, Kleitman acquired two of his avocations—bridge playing and watching six-day bicycle races (a sport popular in Chicago in the 1930s)—as well as his first insights into what he named the diurnal cycle of sleep and wakefulness. During the sleep deprivation experiments Kleitman had noted wavelike ups and downs in

[1] For a comprehensive survey of these early sleep notions, see Kleitman's *Sleep and Wakefulness,* University of Chicago Press, 1939. For the later, revised views, see Kleitman's excellent article "Sleep" in *Scientific American* for November 1952.

his body temperature. Although normally a "thermostat" in the body keeps internal temperature around 98.6 degrees Fahrenheit, Kleitman found body temperature may rise a degree or so above normal during the day and drop a little below it during the night. These variations are not present at birth. Rather, Kleitman concluded, the child adjusts his physiology to the accepted eight-hour-sleep and sixteen-hour-wakeful rhythm of the group. A majority of adults, the conformers perhaps, make this adjustment with greater ease than others. At one extreme of the population are the perfectly adjusted; they are the early birds, waking up spontaneously in the morning, springing out of bed chipper and joyous. Their brains warm up faster, their body temperatures reach their peaks early in the day, and they do their best work before noon. They go to bed early in the night. At the other extreme are the non-conformists, the night owls: slow to rise, sour and slit-eyed, they required the urgings of the alarm clock to get them out of bed in the morning. They warm up grudgingly to the day's activities, reaching their temperature maximum and alertness peak in the late afternoon or early evening. Characteristically, they go to bed late at night.[2]

LIFE IN MONMOUTH CAVE

To prove his contention that there was nothing magic or inherent about eight hours sleep each night, Kleitman, accompanied by a graduate student named Bruce Richardson, spent from June 4 to July 6, 1938, in a chamber in Kentucky's Monmouth Cave. All traces of the earth's day-

[2] The eminent Canadian physician, Sir William Osler (1849-1919), who taught for a time at the University of Pennsylvania and at the Johns Hopkins University, first used the terms of "lark" and "owl" to describe sleepers he observed in his clinical studies.

night cycle were obliterated; temperature and light were held constant, the sun and the stars were never seen, and the normal intrusions of community life such as milkmen, children, and telephones were eliminated. Kleitman and Richardson went on a twenty-eight-hour schedule—nine hours of sleep and a nineteen-hour working day consisting of reading, studying, checking instruments, and walking about the cave. After a week Richardson, who was in his twenties, easily adopted the new routine, both temperamentally and according to his body temperature. But Kleitman, then forty-three, had trouble falling asleep "at night" or woke too early "in the morning." "I offered the greatest resistance to change," he later commented in his report on the experiment in *Sleep and Wakefulness*, "and I also happened to be older." The experiment made the point: the twenty-four-hour day could be unlearned—provided you're young enough.

Newborn babies begin to make such adjustments routinely after the first two weeks of life, Kleitman found. When infants are doing what comes naturally, they follow a 50- to 60-minute cycle of rest and activity. In all, the average baby stays awake only eight hours of the twenty-four. But in a few months, under parental pressure, the baby begins to consolidate his short periodic sleeps into daytime naps and one longer period during the quiet night hours—though with frequent departures from this parental ideal, Kleitman, himself a father, noted. Around kindergarten age the final, afternoon nap is skipped; through adolescence the waking period is progressively lengthened until the adult spends twice as much time awake as asleep—the reverse of the original situation. This pattern suggests that sleep, rather than activity, is the natural state of man, as the poet Swinburne suspected when he wrote that man's life was "a watch or a vision/ Between a sleep and a sleep." If so, the chestnut "Why do

we sleep?" and the search for a sleep center in the brain misplace the emphasis. "Why do we wake?" and "Is there a waking center?" are the better questions. Kleitman was among the first physiologists to recognize this; and a waking center has, in fact, recently been found. (See Chapter Eight.)

Kleitman learned all this with the co-operation of a group of babies and mothers in the university area. To measure the infants' sleep-wakefulness cycles, he attached photoelectric cells to their cribs to record active periods. The mothers helped by keeping report sheets showing the time of sleep. But neither photocells nor report sheets were completely reliable and frequent cribside observing by the experimenters was necessary. One afternoon, as one tiny subject settled into sleep, Aserinsky followed the usual arm wiggles and leg kickings. After all these body movements had ceased, he observed that the infant's eyes continued to move in a slow, rolling motion under the closed lids. Moreover, quick, jerky eye movements were the first activity discernible as the infant woke up. To the researchers, the movements looked like a better physical delineator of the wake-sleep periods than the photocell record. Kleitman decided to experiment with adult sleepers. As it happened, there was a machine on hand that enabled him to measure these eye movements remotely without disturbing the sleeper's natural slumber. The monitor was the electroencephalograph, or EEG, machine.

THE EEG: LISTENING IN ON THE BRAIN

The EEG is essentially a device for recording so-called brain waves, weak electrical currents generated continuously through the skull by millions of pulsing brain cells. This brain "electricity" was first detected in the 1920s by the

German neurologist Dr. Hans Berger of the University of Jena. Berger used standard vacuum-tube radio equipment, inserting electrodes under the skin of the forehead to pick up and amplify the waves. Later the detecting gear was refined; tiny electrodes pasted to the scalp carried the brain waves, via a cable, to a recording machine. There the signals, amplified a millionfold, sent automatic pens jiggling across a slowly turning drum of graph paper. By running the electrode leads into a switch box over a bed in one room and playing out a cable from the box to the EEG recording equipment in another room, sleep could be monitored without awakening the sleeper. Berger found that different "states" of the brain—sleeping, resting, waking—made different signatures on the paper. Awake but resting with the eyes closed, the brain sends rhythmical waves out at from 8 to 13 cycles per second, making a characteristic rippling signature. These were called Alpha rhythms. In deep sleep (depth being judged by the amount of noise it took to wake the sleeper), the waves are large and slow and have a frequency of from ½ to 2 per second—the Delta rhythms. As soon as the brain focuses attention on a task, a sound, or a thought, all waves disappear abruptly—a fact the methodical Berger once demonstrated by exploding a firecracker behind an unsuspecting subject.

Berger published his first report on the EEG in 1929, and his findings were confirmed by Britain's E. D. Adrian and B. H. C. Matthews in 1934. In the United States Kleitman was among the first to exploit EEG techniques. In time the Chicago group wheeled an impressive array of equipment into position to study a night of sleep. Versatile EEG machines were built with channels for displaying, all on one chart, the sleeper's respiration rates (recorded by a tube wrapped around the chest, which expands and contracts with breathing) and body movements (recorded by a photo-

cell device taped to the bedsprings), as well as the brain waves. When Kleitman decided to monitor eye movements, technically it was simply a matter of adding a new channel to the EEG machine and pasting extra electrodes around the eyes. The eye electrode recorded changes in electrical potential when the eye muscles went from the resting to the moving state.

THE REMs

Night after night Aserinsky and Kleitman looked in at the slowly turning drum as the swinging pens traced their patterns. To their surprise, they detected not only the slow, rolling eye movements they had observed earlier in infants, but also fast bursts of eye activity. These appeared on the graph in distinct clusters. Each individual eye movement took less than a second; the clusters, on the other hand, might last anywhere from three minutes to fifty-five minutes. Aserinsky and Kleitman confirmed the EEG report by tiptoeing into the sleeper's room and shining a soft light into his face; under the lids the eyeballs unmistakably shot back and forth. At times it looked as if the sleeper were watching a tennis match. Anyone who shares a bedroom with someone else, or has access to a sleeping person, can confirm this for himself. "It was strange," Kleitman mused to an interviewer recently, "that no one had ever detected them before."

Kleitman named these bursts REMs for Rapid Eye Movements. Going back over the EEG records, he noted that there were changes in the brain-wave pattern associated with the REMs; a cardiotachometer, added to the equipment in a later series of sleep monitorings, showed evidence of increased heartbeat rate during REMs. Apparently some-

thing at once emotional and engrossing was going on in the sleeping brain. Kleitman had the brilliant hunch—he says, "Just call it a hypothesis"—that the sleepers were dreaming. He decided to test his surmise in the only way possible: arousing the sleepers during the REM bursts and asking, "Are you dreaming?" The historic results were reported in a short note in the journal *Science* of September 4, 1953. Twenty-seven arousals during REMs produced detailed descriptions of twenty dreams. As a cross check on the reliability of REMs as an indicator of dreaming, awakenings in the absence of rapid eye movements were made twenty-three times; there was complete failure to recall a dream in nineteen instances. Eventually, using the REMs to snare dreams, the researchers accumulated an impressive total of 152 recorded dreams out of 191 arousals—a percentage of .800. Yet the same sleepers, left undisturbed during a night of clear REM bursts, were unable to recall any dreams the next morning fifteen out of sixteen times.

REMs, Kleitman concluded, were an "objective indicator" of dream activity, just as fever is an indicator of infection. For the first time scientists had a means of summoning up the evanescent shapes and thoughts of the dream—if not precisely as the dream was being dreamed, certainly a few moments later. Moreover they had a ruler to measure the amount, frequency, and duration of dreaming. And apparently there was considerably more dreaming going on at night than anyone from the ancients to Kleitman himself had suspected. Even those who claimed they never dreamed in their entire lives or said they dreamed only once in a while almost invariably reported a dream when awakened during REMs.

Exciting as this REM discovery was, it proved to be only the first small landfall. A whole New World lay ahead.

A NIGHT IN ABBOTT HALL

Aserinsky received his degree and left the university; his place was taken in 1953 by a medical student named William Dement. "They were happy to have anyone who was willing to stay up at night," Dement recalls with a smile. He was young (born in 1928), resourceful, and strong. These qualities, it developed, were the prime requirements of a first-rate dream researcher. In the next two years Kleitman and Dement perfected their dream-monitoring techniques. The procedure they settled upon, still the basis of the new scientific dream research, was deceptively simple.

Sleepers were usually university students paid three dollars a night (the cost of sleeping for research has since gone up to five dollars, along with the cost of living), or volunteers from the physiology department and medical school. Prospective dreamers were instructed to eat normally, abstain from alcolol and caffeine drinks, and report to the laboratory shortly before their usual bedtime. The sleep laboratory consisted of three monastic rooms in Abbott Hall, an imposing Gothic building at the west end of the university campus. Abbott Hall housed the department of physiology and its kennelful (since departed) of experimental dogs; in those days any university student could be led there blindfolded and still sniff out where he was. After the subject changed into night clothes, the experimenter pasted the EEG electrodes—tiny disks at the end of long, colored wires—on his forehead, scalp, temple, and ear lobe. The disks were held in place either with adhesive tape or the colloidon glue used to patch up prize fighters. Other electrodes were fastened to the chest to measure heartbeat. The pasting took about twenty minutes. (Far from being unpleasant, it had, for one

volunteer at least, a soporific effect.) The EEG machine was in a small outer room; a door led from it to an even smaller sleep room with a plain, army-style iron cot. On the cot above the sleeper's head there was the panel box for the electrode leads, a speaker, an ordinary doorbell, and a microphone hooked to a tape recorder. The panel box served the same function as in the first experiments, carrying the leads to the EEG machine in the next room. The speaker enabled the experimenter to talk to the sleeper; the doorbell was used to rouse him any time the EEG record dictated, and the tape recorder enabled the experimenter to make a record of his dream accounts. The equipment also kept the experimenter out of the room throughout the night, made the situation as normal as possible, and minimized the opportunities for inadvertent influence. Inside the sleep room the sleeper settled into the cot. The experimenter plugged in the electrode leads, turned out the light, and closed the door between the two rooms. Then, Medusalike wires sprouting out of his head, sleep came to the subject—at least until the arousal bell rang.

But when to sound the bell? The REM periods, as noted previously, might last from a few minutes to almost an hour. It was apparently impossible to know when to ring the bell without interrupting the dream. And when the dreams were interrupted during the REM periods, one of two sequences usually unfolded. Some aroused sleepers seemed bright-eyed and loquacious as they recounted their dreams in detail into the tape recorder; others seemed to struggle awake and sounded terse, as if they were anxious to get back and finish what they had started. Many of these latter, in fact, fell right back to sleep, the REM patterns resumed, and the dream appeared to go on. These terse subjects also reached their next REM period sooner than the loquacious ones.

Perhaps the longer dream accounts brought the sleeper fully awake and broke off some basic, still enigmatic cycle. Perhaps the terse accounts, on the other hand, permitted the dream episode and this mysterious cycle to continue after this brief "station break." Or finally, perhaps the bell ringing itself had something to do with the patterns. But when the bell was sounded during periods of non-REMs, *no* dreams were reported by either the partial or the full awakers, and no REMs appeared when they went back to sleep. This eliminated the third possibility; apparently the cycle was a natural one, rather than a consequence of the experiment itself.

THE DREAM CYCLE

In 1956 Kleitman and Dement uncovered the essential, underlying pattern that cleared up the mystery of the REMs, the bell puzzle, and centuries of speculation about sleep and dreams. Their discovery, like Kleitman's and Aserinsky's of four years earlier, was made while they were looking for something else.

When Dement first learned of the new dream research at Abbott Hall, he recalls, "I was young and got tremendously excited." In those days the two chief investigators, Kleitman and Dement, frequently had polite but lengthy arguments about the practical implications of the REM findings: Dement, then a medical student with three months of study in psychiatry, was eager to press on to the final secrets of mental illness. He proposed using REMs to study the dreams of schizophrenics. Kleitman, reflecting his physiologist's background, was more cautious. But he encouraged Dement's proposal to study the dreams of schizophrenics at the

Manteno, Illinois, State Hospital south of Chicago. Dement used EEG facilities made available to him by Manteno's Dr. Nathaniel Apter to monitor the REMs of seventeen chronic schizophrenics. As part of the standard operating procedure for determining whether subjects were asleep, the brain-wave patterns were also recorded. There was a minor change, however, in this procedure. In the past the experimenters had only spot-checked sleep throughout the eight hours. This was done in part to conserve EEG paper (a routine twenty-minute brain diagnosis consumes more than 100 feet of paper), and in part to conserve the health of the EEG monitor. Dement, however, unsure of what patterns the schizophrenics might produce, turned the machine on at least one minute in every five throughout the recording night.

The main purpose of the experiment was to compare the content of the schizophrenics' dreams with the content of the dreams of a group of normals—in this case, thirteen of Dement's fellow medical students at Chicago. The results, reported in 1955 in the *Journal of Nervous and Mental Diseases*, confirmed the ubiquitous nature of the dream cycle. The EEG graphs and tape recordings showed that there was no difference at all between the two groups in the *quantity* of dreaming. But there were considerable differences in dream *quality*. The schizophrenics' dreams were often flat, vacant, and unevocative. For example, these dialogues took place when Dement aroused the schizophrenics:

Q. Were you dreaming?
A. Yes.
Q. What about?
A. There was ah—ah—trunk and curtain rods.
Q. A trunk and curtain rods?
A. Yes.

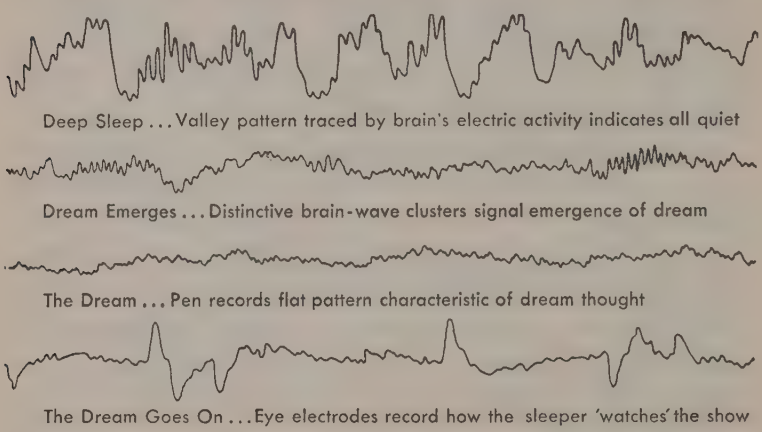
Q. What else?
A. Nothing.
Q. You mean there was nothing but just a trunk and curtain rods? No people?
A. Yes.
Q. Were you in it?
A. I don't think so. I saw them.

And another:

Q. Were you dreaming?
A. Yes.
Q. What about?
A. A shelf.
Q. Is that all?
A. Yes.
Q. Just a shelf hanging in space?
A. Yes.

But the real dividend from the Manteno experiment came not from the tape recorder, but from 200 to 300 extra yards of brain-wave patterns recovered because of Dement's decision to keep the machine on more often. Traced on the EEG paper were the outlines of the underlying dream-sleep cycle, which three years of sampling techniques had missed. All the REM bursts, Dement found, always made their appearance when a distinctive, fast, 10-per-second brain-wave pattern was being traced on the graph paper. This pattern resembled the Alpha rhythm pattern of wakefulness. The REMs might start and stop and start again, but the fast brain-wave pattern continued. Moreover when the fast pattern ended, the REMs ended. All the pieces would begin to fit compellingly together if the REMs were signs that the dreamer was watching some intermittent action

within the dream, while the fast brain-wave signature was the sign of the dream episode itself.


Deep Sleep ... Valley pattern traced by brain's electric activity indicates all quiet
Dream Emerges ... Distinctive brain-wave clusters signal emergence of dream
The Dream ... Pen records flat pattern characteristic of dream thought
The Dream Goes On ... Eye electrodes record how the sleeper 'watches' the show

The work entered a new, exceedingly tedious but necessary phase. The sleepers reported back to Abbott Hall once more, seven women and twenty-six men in all, ranging in age from sixteen to sixty-one (Kleitman himself). This time the EEG machine was run continuously throughout the night. The results were uniformly spectacular:

1. Every time the REMs appeared, the fast brain-wave pattern accompanied them.
2. In a typical night of eight hours' sleep, the fast pattern —and the REMs, now known to be the infallible signature of a dream—appeared four or five times.
3. Throughout the night each dream episode increased in length. The final dream of the night was sometimes four times longer than the first dream of the night.

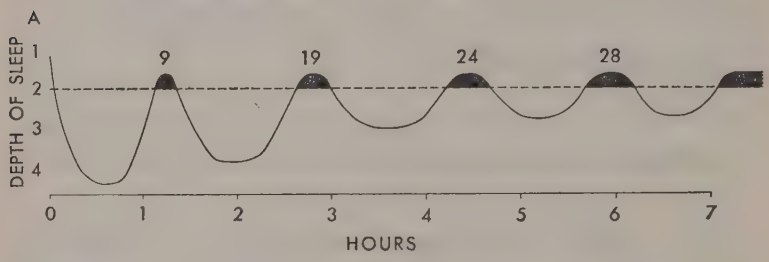
These were exciting and exhausting nights for the dream researchers. On some mornings Dement, after sitting hunched over the EEG machine during an all-night monitoring ses-

sion, pasted the electrodes on himself and straggled into the cot just vacated—and let his wife monitor *his* dreams. Some nights Mrs. Dement served as a volunteer subject herself. On the basis of thousands of hours of monitoring Kleitman and Dement were able to reconstruct the cycle of sleep and dreaming shown below.

THE STAGES OF SLEEP

The pattern is one of crest and trough. At the beginning of the night, as you lie in bed with the lights out and your eyes closed, you show the typical 10-wave-a-second Alpha rhythms. As you begin to "fall" asleep (an old usage that accurately reflects the new findings), the Alpha rhythms break up. The ripples flatten; you are losing touch with the outer world. This transitional state between waking and sleep Kleitman and Dement named "Initial Stage I." Images appear—flashing lights perhaps—and you have the sensation of floating or drifting. If aroused now, you would describe "dreamlike" reveries but nothing like a "real," organized dream. Now down you go toward deep sleep. Your EEG now shows the characteristic sleep spindles, so named because the pen tracings look like wire unwound from a spindle (see chart). These short bursts of waves increase and decrease in amplitude at a frequency of about 15 cycles per second. You are in Stage II, on your way to Stage III. Then, fifteen minutes after you have closed your eyes, come the large, slow waves of deep sleep—what Kleitman and Dement called Stage IV (and what earlier investigators had named the Delta waves). On the graph this stage looks like a hill-and-valley pattern. The pens trace this pattern for something like thirty minutes, then the cycle swings back from IV through II and II to I.

The first cresting of the night begins about sixty to seventy minutes after you fall asleep. You are dreaming. Kleitman and Dement call this period "Emergent Stage I."



The brain-wave patterns traced are about the same as those traced by Initial Stage I. But now the rapid eye movements are present, your arousal threshold is considerably higher, and your dream account is fleshed out and real—hence the distinction between Initial and Emergent Stage I. This first dream episode lasts, on the average, about ten minutes. Then back down the trough again through Stages II and III to deep sleep. But this time, as the graph shows, the trough is not quite as deep as the first time. After another interval of about ninety minutes, or nearly three hours after you went to sleep, you are back again at Emergent Stage I for the second dream act of the night. This one averages about nineteen minutes. Then another ninety-minute cycle of II–III–IV–III–II and back to I again for the third dream act of some twenty-four minutes. The cycle continues throughout the night. Toward the end of the sixth hour of sleep, the fourth dream lasts about twenty-eight minutes; between the seventh and eighth hours, you crest once again and remain dreaming until you are awakened by the alarm clock or your spouse. During this typical eight hours of healthy sleep, you have spent more than one hour and thirty minutes, or 20 per cent of the night, in dreams. The dreams have oc-

curred like clockwork every ninety minutes. They have increased regularly in length throughout the night while the depth of sleep, as measured by the EEG tracings, has steadily decreased as the night progresses.

While naturally there are individual variations in the cycle, just as there are individual variations in pulse rates, its essential accuracy and validity have been confirmed since 1957 by other researchers at the U. S. National Institutes of Health, at Harvard, at New York's Downstate Medical Center, at Walter Reed Army Institute of Research, at Mount Sinai Hospital in New York, and at other institutions.

This nightly pattern is as universal as sleep and as regular as the motions of the planetary bodies. The dream researchers can't prove this directly because they obviously haven't been able to monitor a night's sleep for each and every person in the United States, let alone in the world. But as Kleitman explained in 1959 to a symposium on dreams held by the New York Society of Medical Psychoanalysts: "It can be stated that every normal adult and child over a certain, as yet undetermined, but very tender, age have hallucinatory experiences of dreaming, as a regular, repetitive concomitant of natural sleep."

THE THEATER OF THE MIND

This regular, universal cycle of crest and trough, of dream sleep and deeper sleep, had been missed in the past, we saw, in part because of spot-checking techniques. Looking back at the EEG records, theirs and others, the Chicago researchers saw how other factors conspired to mask the cycle: "model-T" EEG machines, the sleeper's twistings and turnings, which sent the pens racing wildly, currents from the eye electrodes spreading over to the brain-wave electrodes

and vice versa. Once the underlying pattern had been established, however, Kleitman, Dement, and their colleagues became expert at summoning up a sleeper's dreams—at the beginning, at the middle, at the end, or at any measured interval afterward. Like the Welshman Owen Glendower in Shakespeare's *Henry the Fourth*, they could claim to "call spirits from the vasty deep." And the spirits would come.

With his new-found touch, Dement was able to give instruction in the fine art of dream monitoring to other recruits. Among the first was Edward Wolpert, another young, eager, and resourceful medical student. Together, Kleitman, Dement, and Wolpert established the role of rapid eye movements in dreams, and found other physical accompaniments of the nightly dream cycle.

1. The REMs: The Chicago researchers had guessed that the rapid eye movements revealed where the dreamer was looking in the dream. Their analyses of dream transcripts, reported in 1958 in the *Journal of Experimental Psychology*, confirmed this. One sleeper, whose eyes were moving rapidly back and forth as if he were watching a tennis match, was aroused and asked if he had been dreaming; he reported a dream in which two people were throwing tomatoes at each other and he was watching them. Up-and-down eye movements were accompanied by these dreams:

A. I was standing at the bottom of a tall cliff, operating some sort of hoist and looking up at climbers at various levels and down at the hoist.

B. I was climbing a series of ladders, looking up and down as I climbed.

C. I was throwing basketballs into a net, first shooting while looking at the net, then looking down to pick up another ball off the floor.

D. I was standing before a long staircase leading up

into a building. Not sure I was in the right place. I kept looking up and down between the top of the stairs and the address, which was carved in the sidewalk at my feet.

E. I was watching a blimp that hovered over me; the occupants of the blimp began dropping leaflets, and I recall alternately looking up at the blimp and down at the falling leaflets.

In twenty-one dream awakenings after a mixture of both vertical and horizontal REMs, the dreamers in every instance reported looking at people or objects close to them. Sometimes the dreamer was talking to a group of people, sometimes fighting with someone or searching for something.

Following up these findings, Dement and Wolpert aroused six different sleepers over a period of ten nights and compared the very last dream action reported with the very last REM recorded just before the arousal bell was sounded. They were able to get twenty-three clear dream reports with unambiguous accounts of the last action. In seventeen instances the last reported dream activity was identical with the last recorded eye movement. One dreamer picked up an object from the floor as the bell sounded; his last recorded eye movement corresponded exactly to what would have been expected if he had carried out the same action when awake.

But what about the dreams where there was little or no rapid eye movement? Dement and Wolpert went back over 109 tape-recorded dream accounts, representing more than 200 hours of sleep, and found that many of the dreams could be classified as either "passive" or "active." In an active dream the dreamer is a participant, like the basketball shooter, or is watching some event like the tomato fight. Passive dreams included dreams of reflecting on an event, talking quietly to someone, or staring fixedly at something. For ex-

ample, one dreamer reported, "I kept watching the door, expecting somebody to come in."

In general, they concluded, the more lively the dream story, the more REMs there are. But sometimes the dream transcripts can be tricky, and the active-passive classification breaks down. When two different sleepers were awakened after a minute or two of slight eye movement, both reported they were dreaming of driving a car and watching the road; in one case another car came speeding at the dreamer-driver from the left; in the other case the dreamer-driver waved to a pedestrian on the left side of the road. Both EEGs showed identical patterns: a period of eye inactivity followed by an abrupt shift to the left. Yet the crash dream was certainly more "eventful" than the waving dream.

2. Body movements: Since dreaming occurs in the lightest stage of sleep, it was naturally assumed that the EEG graphs would show signs of body restlessness and stirrings during Emergent Stage I, particularly if the dream was an eventful one. The exact opposite proved to be true. As soon as the dream pattern appears and the REMs begin, the sleeper's twistings and turnings cease. Further, when the REMs stop, the body movements begin again. Dement and Wolpert wondered if the body movements might signal the end of a dream scene within the dream act and the beginning of another scene. They decided to sound the wake-up-and-tell-me-if-you're-dreaming bell *during* a REM burst but just *after* a gross body movement was recorded. Four sleepers, without prompting from the experimenters, reported the following:

A. I had just come to the end of a dream, I think, but it was a natural transition point. I had been talking to a friend and . . . [dream described]. Then I had the feeling that the dream ended before I woke up.

B. I don't know if I was awake when I heard the bell. The dream seemed to be over before the bell rang.

C. I'm trying to decide if I was dreaming just when you woke me up. I guess I was . . . [described dream]. I kind of had this feeling that just about as I finished the dream just mentioned there seemed to be a kind of little blank space or something and then just a picture of a telephone or something. I'd got the idea that I'd finished before the bell sounded.

D. [Dream described.] I had the impression that the dream had reached its natural end, that the TV program I was watching had reached its fade-out point.

In one other noteworthy case, a dreamer who had twisted and turned every two or three minutes during a REM period reported a disjointed dream, fragmented into six unrelated episodes. The dreamer volunteered that he couldn't understand why the dream was "so mixed up."

For the metaphor that "captures the essence of this situation," Kleitman credits the novelist Georg Mann, who at the time was a member of the university's public relations office. Mann compared the dreamer to a spectator in a theater. Just before the curtain goes up in the dream play, we fidget in our "seats," shifting our heads on the pillows and settling our shoulders to get comfortable. Then the show begins. The story holds us; we sit spellbound and quiet, except for our eyes, which follow the action. As the scene shifts or the curtain falls, our eyes stop moving. We begin stirring again; the dream episode is finished and the audience is restless. Far from sleeping like a log, the average sleeper may move about between twenty and forty times during a typical night, according to Dr. Joe Kamiya, an early Abbott Hall researcher who is now at the University of California's Langley Porter Neuropsychiatric Institute in San Francisco.

Again, in the play analogy, the dream episode takes as much time to unfold as the same episode would if performed in waking life. This, of course, is contrary to the popular myth, embodied in Maury's "guillotine dream," that "everything happens in a flash." Kleitman, Dement, and Wolpert demolished this myth by noting the time it took for a dream to unfold and later asking the dreamer to act out his dream; the times in each situation were comparable. The *coup de grâce* was supplied fortuitously, in this dream account from one of the subjects studied by Dement and Wolpert:

I was standing by the record player [in a girl friend's apartment] listening to some music and intending to go home. The door bell rang and she asked me if I would answer it. I hesitated for a moment and, as I started to go, it rang again.

The "door bell" was the arousal bell; what had happened was this: the experimenter's finger had accidentally slipped when he sounded the arousing bell and it rang twice, with about three or four seconds elapsing between the two rings.

3. Micromuscle activity: It is, of course, still a rather unusual theater. For the dreamer, in addition to being the audience, is also the playwright, director, and, in many cases, one of the principal actors. And while he may watch the play quietly, Wolpert discovered that he also seems to get involved in it in a shadow way, pantomiming some of the action with slight muscle movements. Wolpert determined this by attaching electrode disks to the arms and legs of eight dreamers, all male, and recording electromyographs—EMGs, or changes in muscle potentials—in much the same way that the REMs were recorded. One dreamer's chart showed a sequence of electrical action that went from the right hand to the left hand and, finally, to the legs. Wol-

pert immediately sounded the bell; the sleeper reported dreaming that he had just lifted a bucket with his right hand, had shifted it to his left hand, and then had started to walk. Another dreamer showed slight muscle movements in the arms and legs combined with gross body movements. He reported that he was dreaming he had extended his arms and legs, jumped over a row of fish with sharp dorsal fins—and that the dream scene ended. Sometimes this muscle activity is vicarious, imitating the performance of another person, as often happens with children at the movies, alumni at football games, and edgy back-seat drivers. One dreamer, in fact, reported he was watching two major-league baseball players warming up for a World Series game. His muscles went through the same motions.

This, then, is the nightly playhouse of the mind, an all-night spectacular with several distinct acts and a far larger audience than anyone had heretofore expected. Like the drama, it could be studied in a number of ways. The physiologists wanted to know about structure: why the periodic episodes? why five acts? The psychologists and psychiatrists were interested in content: what was the relationship between each act? is there a common theme for the night? is there a play of the week? And the curious dreamer, like the ordinary theatergoer, wonders what makes some of the nightly dramas memorable performances and others quickly forgotten divertissements. These three aspects of the nightly cycle—dream memory, dream structure, and dream content—are the topics of the next four chapters.

CHAPTER SIX

Why We Forget Our Dreams

"To Catch a Dream" · The Sleeping Cortex · Dreamers and Non-dreamers · The Visceral Brain · The Girls from Bennington · Movie Thrillers and Autonomic Turmoil · Storehouse of Memory

If you tell someone for the first time about the nightly dream cycle, the chances are that he will say, "It may be so, but I never dream." If you persist in the face of this skepticism and describe the Kleitman-Dement findings in detail, the chances are equally good that your friend will make this comment the next time you meet: "You know, ever since we talked about that dream cycle, I've been having dreams lately."

This is as likely to happen at a scientific meeting as at a cocktail party. On a Friday in December 1960, at the fall

meeting of the American Psychoanalytic Association in New York, Dr. William Offenkrantz, a University of Chicago psychiatrist, described how, for the first time, he had combined the new dream-monitoring techniques with traditional psychoanalytic therapy sessions. An analyst present at the session confessed that, until one week before, she had not heard of the new dream findings and was convinced that she very seldom dreamed. Then, in preparation for the discussion, she did some background reading supplied her by Dr. Offenkrantz. "Since Monday," she reported with a nervous smile, "I have had four dreams that I can remember."

The "I-never-dream" notion is one of the most prominent myths to fall before the new science of dreams, along with other bits of folklore holding that nervous tension, passion, or a late night snack makes us dream more than usual. The simple and sudden recovery of dreams, similar to the incident recounted above, has convinced many doubters who might never have the opportunity to watch the EEG drum turn and hear the dream report come over the intercom. It is far easier, however, to help someone begin remembering his dreams than it is to determine why he forgets them in the first instance. The average adult, even assuming he dreams a below-the-quota three dreams per night, is producing over 1000 dreams a year. The great majority of these certainly are not recalled at all; many others are remembered only in fragments.

Those people who describe themselves as "good dreamers," it is now obvious, are really "good rememberers." But why some people are good at remembering dreams and others poor at remembering dreams is unclear. It is well known among psychiatrists that their patients' ability to recall dreams increases after entering therapy. But even these persons who are, in Dr. Ernest G. Schachtel's phrase, "sensi-

tized to awareness," find it difficult or impossible to counteract the powerful tendency toward forgetting.[1] Even subjects in dream laboratories, awakened right after rapid eye movements and in the presence of the Stage I EEG waves, sometimes fail to report dreams. "The signs of dreaming were all there, but no dream was recalled," one researcher says. "It's as hard to believe the sun didn't rise." Of course the sun *does* rise; the dream cycle is there for all to see, but the dream is forgotten.

This phenomenon of dream amnesia raises basic questions about the mechanisms of memory as well as the nature of dreams. How and why do we forget our dreams?

"*TO CATCH A DREAM*"

The elusiveness of dream memory intrigued Hermann Rorschach, the inventor of the famous "inkblot" personality projection test. Rorschach believed dreams were essentially "kinesthetic" productions—that is, sensory experiences derived from the movements of muscles. In 1942 he set down some rules for "catching a dream." When awakening, do not open the eyes, he advised, and lie perfectly still because any quick motor movement, like jumping out of bed, will drive the dream into oblivion. In a similar vein Proust suggested that one could summon up remembrances of things past only by being "*dehors de l'action, de la jouissance immédiate*."

In 1958 two young members of the University of Chicago dream laboratory made the first physical measurements of the dream evanescence that Proust sought to capture. They showed that the dream can, quite literally, quickly swirl away from memory, first fragmenting, and then completely

[1] *Metamorphosis* by Ernest G. Schachtel. New York: Basic Books, Inc., 1959.

evaporating. The investigators, Dr. Edward Wolpert and Dr. Harry Trosman, a psychiatrist, awakened sleepers at four different times: (1) during the Stage I EEG brain-wave pattern; (2) during a gross body movement immediately after the EEG pattern; (3) five minutes after the Stage I EEG pattern stopped, and (4) ten minutes after the Stage I EEG pattern had stopped. Their results were reported in the May 1958 issue of the *A.M.A. Archives of Neurology and Psychiatry*. The first awakenings, as expected, broke into ongoing dream stories. The second awakenings, again as expected, yielded complete and richly detailed descriptions.

The dreamer, for example, might be dreaming about another person, "a tall man of about forty in a brown-tweed business suit . . . he was smiling and you could see that he had a broken tooth . . . he was wearing horn-rimmed glasses . . ." Or, if the dreamer were describing a scene, the particulars were vivid and specific. A tree, for example, "is off to the right about five feet from me . . . it is graceful with three big branches jutting off toward the east . . ."

Five minutes later, however, the dream account began to break up and separate into fragments, like a frozen river during spring thaw. The dreamer could recall only snatches of the story; figures and scenery became vague: "There was a man in a dark suit standing next to me . . ." "There was a big tree somewhere in the background . . ." Finally, ten minutes after the dreams were over, twenty-five out of twenty-six awakenings elicited no account of the dream. "There was a figure, I think, but I couldn't tell whether it was a man or a woman," one dreamer might say. Or, another: "I couldn't make out the background . . . it might have been the image of a tree . . ." As Wolpert explains it, "Just on the basis of the number of words used to report a dream, there is a straight and dramatic decline."

THE SLEEPING CORTEX

To Kleitman, this evidence fits in with his physiological view of sleep and of dreaming.[2] Dreams are hard to remember, he says, because during sleep the higher centers of the brain are taking it easy. These higher centers, the location of thinking and the memory, are in the cerebral cortex, the gray matter that covers the brain as a rind covers an orange. This is the last portion of the brain to develop on the evolutionary scale from the lower orders to man, the last portion to develop in the growing child, and the first to suffer the ravages of old age. For certain short periods during the day (which may vary according to individuals and occupation), the cerebral cortex operates at peak awareness, receiving incoming signals from the sense organs, analyzing them, critically comparing them with past stores of experience, taking action if necessary, and storing new information for later use. Other times during the day there may be less input and less analysis as the individual goes through routine tasks like washing dishes or driving a car or copying a letter; on a scale of consciousness the housewife, the driver, or the typist could be considered half aware but still awake. At night, as sleep comes, the streams of incoming signals wane; the muscles relax, the heart slows, the breathing becomes deeper and more regular. Awareness subsides. The cortex, which at full power selects, abstracts, integrates, compares, and stores experiences, now falters. The analytical ability of the cortex becomes dulled, accepting situations and relation-

[2] The views summarized here were expressed most recently by Kleitman in April 1959 at the Symposium on Dreams, sponsored by the New York Society of Medical Psychoanalysts, and in an article, "Patterns of Dreaming," written for *Scientific American* for November 1960.

ships and ideas it would have rejected in waking life. Mental activity is in low gear. The dream, which Kleitman believes reflects this low-grade cortical activity, can now begin.

This dream state, Kleitman holds, has much in common with the inadequate thought processes and short memory spans of the very young, the very old, and the very drunk. In each case the cerebral cortex operates at less than full effectiveness. In the young, the cortex is still developing; in the old, it is worn and weary; in the drunk, it is temporarily thrown out of order by the alcohol flowing in the blood that ultimately bathes the brain. Each has dreamlike experiences. In Kleitman's examples: The lone child may play "pretend" with a nonexistent playmate whose physical presence he accepts, or tie a string around his finger and then forget what it was supposed to remind him of; the old widow may carry on conversations with her long-deceased spouse or forgetfully tell the same stories over and over again; and the drunk cannot remember a thing he did after that seventh martini.

From this point of view the question is not so much why we forget dreams as it is why we are able to remember *any* of this low-grade cortical activity upon awakening. Part of the answer would be that the morning alarm clock or our own built-in alarm (developed by years of habit) usually wakes us during the course of the final—and longest—dream of the night. As a result, only the last scene of the night-long drama may ever be recalled. As for the others, the earlier dream acts of the night, there are some indications that they are not always lost. Recent direct observations of sleepers made by Dr. Dement suggests that some people, perhaps everyone on occasion, become fleetingly but fully awake several times during the night, usually following a dream. They have, as it were, a built-in bell that arouses them. Why

there is this bell and what triggers it is still not known. Nor are there any statistics available on how often sleepers awaken during the night or on how widespread such night restlessness might be. Perhaps some parts of the old folklore of dreaming can be refurbished to account for these spontaneous awakenings. Lobster salad, welsh rarebit, and other highly seasoned midnight snacks could keep the sleeper from reaching his usual depth of sleep. So could an argument with the boss, a thwarted love affair, worry over an examination the next day, or some other emotional tension. Changes in the sleeping environment might also make a difference; Freud himself remembered a series of his dreams during the time he was sleeping on an unusually hard bed (page 44). While none of these disturbing elements may affect the amount or frequency of *dream episodes* in the nightly cycle, each could affect the amount and frequency of *dream recall* if it aroused the sleeper into fitful wakefulness during the night.

Whether all, or even most, of dream forgetting and dream remembering can be explained on such strictly physiological grounds is an open question. Since 1957 a rich lode of new facts about dream recall has been uncovered that is difficult to account for unless psychological factors are taken into account. For one, an individual's ability to recall his dreams may vary not only from night to night, but from dream to dream within the same night. Second, the individuals who claim they never dream are sometimes dilatory about going to bed and then harder to wake during the night. Third, the individuals who say they are good dreamers seem to fall quickly to sleep as soon as their heads touch the pillow. "They act like people who like to sleep," one researcher comments.

DREAMERS AND NON-DREAMERS

All this suggested to some dream scientists that the personalities of the sleepers have a great deal to do with the forgetting of dreams. The first researchers to investigate this question were Dr. Arthur Shapiro, an internist, and Dr. Donald R. Goodenough, a psychologist, both working at the State University of New York's Downstate Medical Center in Brooklyn. As late as 1955 Shapiro and Goodenough, along with most scientists, were unaware of the Chicago dream work. Their research group was tidying up a fifteen-year-long study of perception in man and had just begun to cast around for other research projects. Shapiro, who had a long-standing interest in the relationships between mental processes and the body illnesses he treated daily, suggested that the group study "the nature of consciousness." Dr. Herman Witkin countered with "dreams." Shapiro started reading through the published work and came across the Chicago experiments. He got Kleitman on the phone, asked what the Chicago group was doing, and received an invitation in the best tradition of science: "Come out and see for yourself," Kleitman told him graciously. Shapiro and Goodenough proved to be adept and valued additions to the ranks of the dream monitors. Within a year they had their own laboratory, a corner suite at the Downstate Medical Center's new building on Clarkson Avenue. Instead of a doorbell they played a recording of a bell through a speaker to awaken their subjects; when the aroused subject lifted a bedside recorder-phone, the signal was automatically cut off. Otherwise the monitoring procedure was the same as that at Chicago.

In 1957, as the first part of their study of the forgetful dreamer, Shapiro and Goodenough divided a group of sixty

volunteers from Brooklyn College into categories on the basis of a questionnaire. Students who indicated on the questionnaire that they recalled dreaming almost every night were designated "dreamers." Students who said they never dreamed or dreamed less than once a month were grouped as "non-dreamers." Then eight students from each group were monitored in the standard fashion for three nights each. Shapiro and Goodenough reported their results in the November 1959 issue of the *Journal of Abnormal and Social Psychology*. They had no trouble demonstrating that all the students dreamed every night. Even those who claimed they were non-dreamers gave detailed dream reports when awakened at the right time. Nevertheless two subtle differences turned up between the goups. For one, the non-dreamers seemed to mislabel their dream experiences. One sleeper, aroused during an unmistakable rapid-eye-movement period, reported he was "asleep and thinking." Others aroused from sleep after a REM period could not make up their minds whether they were "asleep and dreaming" or "awake and thinking." Another student, when being given the presleep instructions on how to report into the bedside phone, asked, "How will I know if I have had a dream or not?" Shapiro and Goodenough were surprised by the question but, after thinking about it, concluded the question was a reasonable one to be asked by a person who said he never recalled any dreams. Later the same student gave this account when awakened after a REM period:

I don't know whether I am dreaming or not. I'm not sure whether I was asleep or not. I had a vision in mind of riding down a wide avenue—no story, but moving, as if sitting in an automobile and the various houses and buildings passing by—a vision. I may have thought that or dreamed it.

Another student showed the same uncertainty at the beginning of his dream account but then came to a different conclusion:

I am not sure whether I fell asleep. Oh, yes, I was at the beach. I was with my mother and father and a girl next door. She is a friend of the family, not too much a friend of mine. We were talking, and I couldn't sit next to her, so I was somewhat displeased, so I changed to another seat. . . . I can remember specific conversation. People came up to me and asked me why I was carrying my bag—clothing bag. I looked in the newspaper for a certain basketball score. Basketball is in the winter. I think I must have been asleep. I wouldn't have been thinking about this if I had been awake, I don't imagine. I guess I was dreaming.

In this latter example, Shapiro and Goodenough pointed out, the sleeper decided he was, in fact, dreaming because he was in the company of a girl he didn't particularly care for and he was looking up a basketball score out of season. The fact that the dream was unreal (why would he sit with a girl he didn't like?) and inconsistent (basketball is a winter sport, the beach scene was in the summer) convinced him that he was dreaming.

One psychological reason for dream amnesia, then, is apparently a matter of definition. Some of the non-dreamers simply don't know what a dream is. But a second, and perhaps decisive difference between the non-dreamers and the dreamers was noted by Shapiro and Goodenough. The non-dreamers were sometimes harder to arouse during their dream episodes (as indicated by the rapid eye movements and the Stage I EEG) than were the acknowledged dreamers. Compared to other dreamers, these slow wakers usually had little or no dreams to report. But when Shapiro and Goodenough

turned up the volume of the bell recording and improved the soundproofing in the laboratory to mask their movements, the sudden, louder arousing signal was followed by a higher percentage of dream recall. It was as if they had taken the dreamer "by surprise" before he had time to forget his dream.

Though neither Shapiro nor Goodenough is a psychiatrist, they well know that more than fifty years before, Freud had suggested a comprehensive psychological mechanism that could explain many of the phenomena they were observing for the first time under controlled laboratory conditions. The sleeper doesn't remember his dreams the next morning, Freud claimed, because of the dangerous implications of the dream thought. "The forgetting of dreams," he wrote, "depends far more on the resistance [to the dream thought] than on the mutually alien character of the waking and sleeping states." Simply put, dream amnesia is due to feelings rather than to physiology.

A mechanism of massive repression that went into action sometime between the arousing bell and the dream report would account for a number of perplexing observations of dream forgetting that had been made from time to time by various dream investigators. For example, it had been observed that gradual awakeners recalled less of their dreams than abrupt awakeners. During the time the former struggle up from sleep, it could be argued, the psychic censor has an opportunity to blue-pencil the dream narrative. This repressive mechanism could explain why the louder bell volume in the soundproof room brought more, and more detailed, dream reports. The sudden, sharp awakening meant the censor had less time to disguise, distort, or repress the dream report. And, finally, a repressive mechanism could help account for dreams that were altogether unreported—the "failure of the sun to rise."

In late 1959 Shapiro and Goodenough began to test these suppositions with a larger group of twenty-five dreamers and twenty-five non-dreamers. Awakenings are being made abruptly and gradually by varying the volume of the bell. The figures for early night recall compared to late night recall will be tabulated. Then a psychoanalyst, Dr. Helen Block, will be brought in to study the contents of the dreams recovered under these various situations. Tentatively, Shapiro and Goodenough suspect that the gradual awakenings of the non-dreamers will result in less dream recall. Conversely, abrupt awakenings of dreamers should produce considerably more dream narratives. Finally they suspect both that the dreams recovered in the two contrasting circumstances will differ significantly and that the two groups will show distinct personality differences. "Psychologically speaking," says Shapiro, "the person who claims he doesn't dream or cannot recall his dreams may turn out to be the over-controlled person who handles his problems by denying them."

About the time these dream-recall experiments were being conducted at the Downstate Medical Center, another group of scientists at the U. S. National Institute of Mental Health in Bethesda, Maryland, became interested in the new techniques for dream research. Under the direction of Dr. Frederick Snyder, the institute's Laboratory of Adult Psychiatry verified the original Chicago findings and expanded the dream-monitoring techniques to measure a previously unsurveyed area of human behavior—the emotional "turmoil" of dreams. In the course of these new measurements, Snyder made some intriguing contributions to man's understanding of dreaming, dream memory, and the body changes that accompany the expression of human emotion. In order to appreciate these contributions, it is necessary to know something about the organization and nature of emotion in man.

THE VISCERAL BRAIN

Among the measurements that Kleitman made in his original dream-monitoring experiments were those of the pulse and the respiration. Though his instruments detected some signs of increased heartbeat and more rapid breathing during the period of eye movement and Stage I EEG, Kleitman did not follow up this promising hint of heightened emotional activity during dreaming. Instead, understandably enough, he concentrated on elaborating the basic dream cycle itself. These signs of emotional activity during dreaming, however, intrigued other, medically oriented, dream investigators, who saw in them a clue to important mind-body relationships.

The heart and the lungs, along with such other internal structures as the blood vessels, the glands, the uterus, the alimentary canal, and the bladder, are controlled by the visceral or autonomic nervous system. For more than 100 years, after the publication in 1800 of *Recherches Physiologiques sur la Vie et la Mort* by M. F. Xavier Bichat, the accepted medical doctrine was that the autonomic nervous system, as opposed to the voluntary, or central, nervous system, operated independently of conscious influence. For example, the brain could not instruct the vagus nerve to speed up the heartbeat, nor could it command the sweat glands to secrete. Rather these physiological functions were carried out reflexly—that is, they were controlled at lower levels of command in the brain stem. On the emotional side, the "visceral feelings" of love, hate, fear, or flight were considered beyond cortical influence, a belief that is still reflected in the language of everyday usages. The heart "jumps" or "melts," people "break out" in a sweat, the breath "catches," there are "butterflies"

or a "sinking feeling" in the pit of the stomach, the skin "tingles" or "blushes"—all involuntarily. (Such autonomic reactions are the basis for the so-called lie-detector machines, which detect not lies, but changes in autonomic activity presumed to accompany lying.)

In the last three decades the old ideas about the autonomic nervous system and visceral emotions have changed. The agent of this change in outlook has been the growth of psychosomatic medicine and the new doctrine that conscious psychological factors can affect visceral activities. Today medical students are routinely instructed that heart attacks, hypertension, asthma, ulcers, and ulcerative colitis, among other visceral disturbances, may be due to psychological as well as organic causes. The precise patterns of this causation are still being plotted, notably by Dr. Paul D. MacLean, a neurophysiologist formerly at Yale University School of Medicine and now at the National Institute of Mental Health. MacLean's work, in turn, is an extension of the now classic theories of Dr. James Papez who, in 1937, suggested that certain areas deep within the brain, such as the hypothalamus, add "emotional coloring to psychic processes." The act of reading an erotic novel, for example, is an intellectual process involving the cortex, but the physical changes that may accompany this activity—increased heartbeat and respiration, a flushed face—are mediated by these deeper brain areas. Building on this theoretical foundation, MacLean has drawn a new map of the brain. The brain, Dr. MacLean suggests, can be "divided" into two parts —the old, visceral brain that feels and the new, intellectual brain that knows. This visceral brain, known also as the limbic lobe or as the rhinencephalon, has three important attributes:

1. It is animalistic—anatomically, the visceral brain is a "common denominator" in the brains of all mammals.

2. It is crude—structurally, the development, architecture, and organization of visceral brain cells are essentially the same from mouse to man.

3. It is central to emotions—functionally, the visceral brain has nerve-pathway connections with both the lower autonomic structures in the brain stem and with the higher cerebral centers of thought.

In an article in the October 1958 issue of the *American Journal of Medicine* MacLean hit upon a striking analogy to describe the old visceral brain and the new intellectual brain. Think of them, he suggests, as television screens designed by Nature to give the individual as clear a picture as possible of his environment. The visceral brain was Nature's first crude experiment, similar to the old 9-inch screens of early television. The picture is muddied and indistinct, eluding "the grasp of the intellect because its animalistic and primitive structure makes it impossible for it to communicate in verbal terms." The visceral brain, in fact, is illiterate, too crude to analyze language but perhaps capable of grasping symbols. "One might imagine," MacLean writes, "that though the visceral brain could never aspire to conceive of the color red in terms of a three-letter word or as a specific wave length of light, it could associate the color symbolically with such diverse things as blood, fainting, fighting, flowers, etc." Lacking the analytical abilities and sensitivity of the new brain, the visceral brain presents a picture of the outside world in terms of inner, "gut" feelings. Moreover visceral reactions frequently are blended and fused with what the individual sees, hears, or smells. In MacLean's examples, a child looking at a leaf may say, "It tastes green." The primitive may attribute a feeling of anguish to an animal squirming in his stomach. And the neurotic adult may blindly discharge emo-

tional reactions to the lower visceral centers without the mediation of reason.

The new brain, on the other hand, provides a wide-screen, clear, distinct, and literate picture of the outer world—everything the individual needs to adjust to his environment. But the old brain is not discarded. Using electroencephalography, cerebral radioautography, neurochemical analyses, and other tools of modern neuroanatomy, MacLean has shown that it is still present and functioning in modern man.

When MacLean's colleague at the National Institute of Mental Health, Dr. Frederick Snyder, heard of the early Kleitman experiments, he had been concentrating on the relationships between the visceral emotions and psychosomatic illnesses. It was apparent to him that the Kleitman techniques might offer an unexcelled opportunity to measure these emotional states under the ideal condition of sleep. During sleep, it seemed reasonable to assume, the higher centers of the new brain would be less active, perhaps turned off entirely. The visceral brain, on the other hand, might still be "turned on" in some form. That form is strongly suggested by the attributes MacLean assigned to the visceral brain. The old brain's productions, according to MacLean, are symbolic, elusive to memory, emotional, and highly charged. A familiar image begins to emerge; these terms that MacLean was led to use to characterize visceral feelings are good, apt descriptions of the nightly dream play. This, however, was speculative. It remained for Snyder to indicate in what sense these speculations might be true.

THE GIRLS FROM BENNINGTON

Snyder began his dream researches in 1959, working with a rather unusual group of subjects, including young men volunteers from the church of the Seventh-day Adventists

and young women volunteers from Bennington College.[3] The Adventists were working out their military obligations (because the institutes are federal agencies, arrangements have been made for conscientious objectors to serve as volunteer "guinea pigs" for the approximate length of the draftees' military tours of duty). The Bennington girls were on their "work semester." The volunteers were prepared for a night of monitoring in the standard fashion. But in addition to the usual EEG electrodes on the scalp and around the eyes, Snyder made measurements of three different visceral reactions during dreaming. He fastened a tubelike pneumograph around the sleeper's chest to measure variations in the rate of breathing. He also attached electrodes to the chest in order to record heart rate. For a third measurement a metal ring with a photoelectric cell, known as a plethysmograph, was placed on the middle finger of the right hand to record the shape of the pulse wave in the blood vessels of the finger. Finally a thermistor recorded the temperature on the skin of the hand. When Snyder looked at these records during dreaming, he found that there was a great flux and change in the amount of autonomic activity going on—even greater, in some cases, than the activity during waking thought. He also found that this "visceral participation" in dreams followed a nightly curve, typically moderate during the first dream, increasingly active as the night progresses, tending to reach a peak around the third dream act of the night, and then declining toward morning. As the next step in his experiment, Snyder woke his subjects and asked them to rate their dreams on a four-point scale of vividness. Again,

[3] The long arm of coincidence has reached mightily here. The church of the Seventh-day Adventists, according to Professor James P. Chaplin, chairman of the department of psychology, University of Vermont, was founded on the prophecies of the Bible, including the dream of Nebuchadnezzar in Daniel 4: 1–37. See the chapter, "The End of the World," in Chaplin's book *Rumor, Fear, and the Madness of Crowds*. New York: Ballantine Books, Inc., 1959.

according to the dreamer's own ratings, the intensity and vividness of the dream acts tended to increase as the night progressed, reaching a peak around the third dream of the night and then declining toward morning. One dream, rated as a plus four, went like this:

I was dreaming that this morning I was to go up to . . . After this test I came out of the elevator and there was a new nurse on the floor. A *real* pretty one. . . . I dreamed she was carrying a trayful of test tubes which had blood and we collided and we knocked them over. But then we got up and we started laughing. . . .

A minus two dream, pale and mild, might sound like this:

I dreamed I was back home, living on the farm we used to live in. I was in the pantry of our house, stirring up a cake. I was getting out the mixer to mix the cake in the bowls. That's all.

MOVIE THRILLERS AND AUTONOMIC TURMOIL

The nightly dream cycle has been likened to a drama watched at regular intervals throughout the night by the spectator-dreamer. The early dream experiments revealed a spectator who fidgeted until the curtain went up and then sat spellbound watching the action unfold, sometimes pantomiming the actions with slight movements of the arm and leg muscles. In later work Snyder added a possible new dimension to the spectator's reactions: the crude emotional responses of the viscera. In this respect the theatrical analogy is particularly apt. In real life a great deal of visceral activity takes place among the members of a theatrical audience. Wit-

ness the heart-stopping moments in *The Diary of Anne Frank;* or the "gut" emotions stirred by melodrama as obvious as *Uncle Tom's Cabin;* or the bristling of the hair on the back of the neck when the screen shows the Stars and Stripes being planted on Mount Suribachi—emotions expressed, one is tempted to say, in spite of ourselves. The literate new brain, using MacLean's terms, might remonstrate, "This is only a play, a movie, a re-creation by Hollywood actors." But the old brain is neither as sophisticated nor as discriminating, a fact that successful playwrights have sensed since Aeschylus.

This theatrical image can be carried one step further without losing its validity. Among his plans for further research, Snyder has devised an ingenious experiment to compare the visceral emotions experienced during a particularly vivid dream with the uncritical responses of the spectator to melodrama or movie "thrillers." Volunteers, appropriately wired, will be shown highly dramatic films intended to stir such reactions as love, fear, lust, and tenderness (a mother holding and kissing her child might be an example of the latter). Their autonomic reactions to the stock cinema scenes of "The Kiss," "The Chase," "The Fight," "The Cavalry Charge," and "The Assault" would be recorded by pneumograph electrodes, plethysmograph, and other instruments.

An effort would be made to classify the various visceral responses according to the dramatic stimulus. Scenes of warfare may trace one distinctive pattern on the record, the depiction of tenderness another pattern. Then the same measurements would be taken at night during dreams. The movie records and the dream records would be compared to determine the extent of their similarities. Eventually it might be possible to inspect the turning record and determine the specific emotional quality of a dream as it is being dreamed.

Already the theatrical analogy has inspired one experiment directly related to psychosomatic ailments. In May 1961 the psychoanalyst Franz Alexander described to the American Psychiatric Association's annual meeting how he and his associates at the Mount Sinai Hospital in Los Angeles showed the French motion picture *Wages of Fear* to a group of hyperthyroid patients. One day before the viewing Alexander administered a "tracer" of radioactive iodine to the patients in minute quantities. Since the thyroid is the gland where iodine is used to manufacture thyroid hormone, radioactive iodine is taken up there and can be "traced," or recorded, with a Geiger counter. During the film the group wore electrodes to record changes in the galvanic skin resistance (a measure of "clamminess"), heart rate, and respiration, and Geiger counters were placed on their necks over the region of the thyroid gland. A radioactivity count was taken as they watched the film. Though several of the patients denied that the film had any effect on them ("it was foolish–I didn't notice it"), the Geiger counter showed otherwise. According to the counter, their glands began to manufacture double the normal quantities of thyroid hormone during the movie and continued to do so up to two hours later–a convincing demonstration of how emotional stress can aggravate an already susceptible subject.

One further experiment, planned by Dr. Shapiro, could tie together neatly the visceral turmoil observed by Snyder and the psychosomatic responses described by Alexander. Certain illnesses, such as bronchial asthma, cardiac failure, and crises in ulcers, tend to strike in the middle of the night. In fact there is one form of coronary trouble that occurs so frequently at night, and so rarely during the day, that it is known as nocturnal angina. Perhaps, Shapiro has suggested, the nightly dream cycle may be responsible. Eventually he

hopes to determine this responsibility by matching up intensely experienced dreams, the record of the visceral changes, and the onset of illness in patients with a history of nocturnal angina.

STOREHOUSE OF MEMORY

If dreams are so vivid and visceral and intensely felt—even capable of triggering organic illness—why, then, aren't more dreams remembered? The nature of the old brain suggests an answer different from those advanced by Kleitman and by the followers of Freud. Perhaps these vivid, "feeling dreams" from the old visceral brain are "preverbal"—the color red or the image of blood, rather than the words "red" or "courage" in MacLean's example. Other dreams of the night may be "thought dreams" from the new brain, less vivid but at least capable of being grasped by the memory and expressed in words. If this is true, then it might be necessary to distinguish between different types of dreams in the nightly cycle. "These are wild speculations," Snyder cautioned an interviewer, "but maybe the dream cycle samples different layers of the mind during the night." That such "layers of the mind" exist is implied in the concept of memory. The remembering and forgetting of dreams is part of the large and still vexing phenomenon of man's capricious, perishable, fallible, yet subtle and enduring memory. The plots and passions of the dream appear to come from the dreamer's experience. As Shakespeare noted, "What's past is prologue." But what is the nature of this experience and where is it stored?

One layer of experience may be a mass of *primitive memories* from the old brain. This is a collective, impersonal memory, which may be shared to some extent, as Jung

guessed, with all other men and perhaps with all other mammals.[4] Other layers have been plotted over the last twenty-seven years by the Canadian neurologist Wilder Penfield in a series of over 1000 craniotomies, or "open-brain" operations, at the Montreal Neurological Institute. These operations were performed to remove epileptic pressure centers and other diseased sites. As a secondary benefit, while the living brain was exposed and the patient under local anesthesia, Penfield and his fellow surgeons were able to probe the cortex with needle-like electrodes. In his summarizing reports on the craniotomies, in the issue of the journal *Science* for June 26, 1959, and in the *Proceedings of the National Academy of Sciences* for February 1958, Penfield described how he pinpointed an area of the cortex above the temporal lobe (sections of the brain that lie just under the temple on each side of the head) where a record of the past is stored.

When an electrode delivers a mild shock to this area, it may cause "a stream of consciousness" to flow again; the experience is picked out at random from the past, suddenly and in great detail—in Penfield's phrase, like a cinematographic track or a tape recorder. For example, when the electrode was applied, the patient S.B. said, "There was a piano over there and someone playing. I could hear the song. . . ." The next time the same area was stimulated, S.B. said, "Someone speaking to another, and he mentioned a name, but I could not understand it. . . . It was like a dream. . . ." Again the point was stimulated without S.B.'s

[4] Baboons, for example, are higher primates now in a transitional stage between arboreal and ground life, similar to the one that modern man's ancestors faced. According to Professor Sherwood Washburn of the University of California's department of anthropology, baboons are afraid of snakes and terrified of the dark; they arrive at the trees where they sleep before night falls and stay in the branches until it is fully light. "Fear of the dark, fear of falling, and fear of snakes seem to be basic parts of the primate heritage." See the article by Washburn and Irven DeVore in the *Scientific American*, July 1961.

knowledge. He said, "Yes. 'Oh Marie, Oh Marie!' Someone is singing it." After the fourth stimulation he heard the same song again and said it was "the theme song of a radio program." Penfield called this *experiential memory*—a random re-enactment of a conscious sequence from the past, unaltered by later experience. In this sense it differs from another form of electrode response, the *interpretative memory*. In some cases, when the electrode is applied the patient has a "sudden feeling" about the present situation; it is an interpretation of the present, Penfield says, but not one that the patient thinks about deliberately.

For example, the patient N.M. reported after stimulation: "Just a tiny flash of familiarity and a feeling that I knew everything that was going to happen in the near future . . . as though I had been through all this before."

As Dr. Lawrence Kubie has noted in an essay in the *Psychoanalytic Quarterly* for January 1953, "the electrically evoked experience . . . is the very stuff of dreams. . . . It is Proust on the operating table; an electrically stimulated *Recherch du temps perdu.*" But is it really "*temps perdu?*" MacLean's work, Penfield's findings, and the recovered dream narratives may indicate that no times are ever lost.

CHAPTER SEVEN

The Need to Dream: 1. Experiments

Provoking Dreams · Drugs and Dreams · Sleep Deprivation, Brainwashing, and Wakeathons · The Ordeal of Peter Tripp · Nights of Dream Deprivation · "A Pressure Builds" · Dreaming by Day

Every night every one of us, whether or not we remember in the morning, dreams a certain fairly fixed amount. "We now know that dreaming is a basic, regularly recurring, biological phenomenon," one investigator says with a slight touch of awe. "That old dream comes right through on schedule, like a crack train."

Money can't buy more dreams or buy them off; nor can dreams be willed, or initiated by outside stimuli. Only drugs and drink, in large doses, seem to be capable of derailing the dream cycle. Behind this steady schedule there is a com-

pelling human need to dream. This chapter describes how the need to dream was discovered, and the following chapter discusses what the nature of this need might be.

Typically, as we have seen, a night's sleep includes four to six dream episodes, which together account for approximately 20 per cent of the total sleep time. In a normal eight hours of sleep this means some ninety-six minutes of dream time. At the University of Chicago Dr. Allan R. Rechtschaffen, a psychologist and one of the group of young men carrying on Kleitman's work, offered to reward subjects in his dream laboratory if they turned in more or less than the night's regular quota of dreams. Rechtschaffen, in a study still under way at this writing, worked out the following system to see if there were "dreams that money could buy": A volunteer's normal amount of dreaming is determined during a series of base-line dream nights. Following the series, the volunteers report to the laboratory and select a sealed envelope from a pile on a table. Inside the envelope is a slip of paper with an offer on it. The offer might be to pay the dreamer one dollar for every fifteen minutes of dreaming above his normal average. Or it might be to pay him one dollar for every fifteen minutes of dreaming below his average. The rewards are progressive: two dollars extra for every thirty minutes above or below, three dollars extra for every forty-five minutes above or below. Since the dream monitor does not know what slip the dreamer has picked, his interpretation of the EEG record can not be biased in favor of the experiment.

So far the reward offers have had no effect on the amount of dreaming. Nor has the use of what Rechtschaffen calls "ego-evolving instructions" in a second group of experiments. This technique requires a bit of play-acting. During the wiring-up preparations, the experimenter casually mentions to the subject that "intelligent people dream more than

lowbrows." The idea is that the subjects might try a little harder to dream in order to show the experimenter they are intelligent. Again, no significant change in the amount of dreaming has been noted to date.

PROVOKING DREAMS

These experiments tend to show that the dreaming cycle is independent of deliberate, wakeful control (control of dream content, on the other hand, is another, more complicated matter; see Chapter Nine). They are paralleled by another series of experiments demonstrating that the cycle cannot be affected by external physical factors.

Taking up where Maury and other investigators of the "stomach-ache" school of dreams left off in the nineteenth century, Dement and Wolpert exposed sleeping volunteers to three kinds of external stimuli: a recording of a pure tone of 1000 cycles (middle C) played for five seconds; a 100-watt light bulb shone directly on the sleeper's face, and a fine spray of cold water squirted on the sleeper's arms and legs with a hypodermic syringe.

The sound, the light, and the spray were each applied *outside* the dream period, as indicated on the EEG, during several different nights; in no case did any dreaming or dream recall result. Some of the stomach-ache theory, however, was salvaged. When the sound, light, or water stimulus was introduced *during* a dream episode, the dreamer sometimes wove it into the ongoing action. The tone might appear as a brief roaring sound in the dream, such as an earthquake, or a plane crash just outside the house, or "a noise like Niagara Falls." The light bulb introduced such elements as fire, lightning, and shooting stars into the dream. (In one case the dreamer dreamed the experimenter was flashing a

light in his face!) The water spray brought sudden rainfalls or leaking roofs into the dream.

Subject A, for example, was sleeping on his stomach with his back uncovered. A rapid-eye-movement period began; after it had gone on for about ten minutes, Dement entered the room and sprayed cold water on the sleeper's back. Exactly thirty seconds later he was awakened. The dreamer described a detailed dream involving acting in a play. In the middle of the play, he said:

I was walking behind the leading lady, when she suddenly collapsed and water was dripping on her. I ran over to her and felt water dripping on my back and head. The roof was leaking. I was very puzzled why she fell down and decided some plaster must have fallen on her. I looked up and there was a hole in the roof. I dragged her over to the side of the stage and began pulling the curtains. Just then I woke up.

Another volunteer, Subject B, was sleeping on his back. It was a hot summer night and he was completely uncovered. After a five-minute eye movement period cold water was sprayed on his feet and legs. One minute later he was awakened. He recounted how he had been dreaming of being in a room, talking to some friends. Then:

Two children came into the room and came over to me, asking for water. I had a glass of ice water and I tipped the glass to give it to them. I was sitting, and I spilled the water on myself. The children wanted the ice and tried to grab it, but it slipped away. I got mad because they were so greedy, and tried to shove them away from the chair. Then I got out of the chair and was going to change my pants. As I

left the room, I seemed to be in a school and I saw many children in the hall and I seemed to be late for a class. I was starting to climb up some stairs when the bell rang.

Dement and Wolpert also tested the role of internal physical stimuli on dreaming. Three volunteers went without water or other fluids for twenty-four hours and then ate salted peanuts before going to sleep. They were so thirsty and dry they couldn't salivate. Fifteen dreams were recorded. None dealt with thirst or drinking directly. The closest thirst-related dreams went like this:

A. I started to heat a great big can of—a great big skillet of milk. I put almost a quart of milk in.

B. Somebody raised a glass and said something about a toast. I don't think I had a glass.

C. While watching TV I saw a commercial. Two kids were asked what they wanted to drink and one kid started yelling, "Coca-Cola, orange, Pepsi," and everything.

On the basis of these experiments Dement and Wolpert concluded, in the *Journal of Experimental Psychology* for June 1958, that internal and external physical stimuli at most inject new elements into the dream story, but could not initiate a dream. The dream story itself—its actions, images, and characters—exists mainly within the dreamer himself.[1]

[1] The idea that external stimuli produce dreams persists despite these elegant experiments. It was found recently in the feature called "That's a Good Question," in the June 1960 issue of *Today's Health*, a publication of the American Medical Association. A reader sent this question to Dr. William Bolton, who conducts the department:

"I have a dream from time to time in which a ferocious lion is chasing me. It hasn't caught me yet, but I usually wake up with my legs aching from having run so hard. What do you suppose is the cause?"

In his answer, Dr. Bolton referred to "spur-of-the-moment dreaming." "In this," he went on, "virtually anything may be responsible, such as some strange noise that is not enough to waken one but is noted by the sub-

DRUGS AND DREAMS

Even drugs and alcohol, taken in moderate amounts, couldn't shake or break the regular crest and trough of the dream cycle. One night Dement took some Benzedrine right before going to sleep. The idea was to see whether this stimulant would increase the number or length of dream acts by keeping the brain in a light stage of sleep. Although Benzedrine is effective within an hour after it is taken, the results were negative; the dream cycle remained unchanged. At the University of Cincinnati, Drs. Roy M. Whitman, Chester M. Pierce, and James Maas recently measured the effects of the tranquilizing drug meprobamate (trade name, Miltown) on the dreams of a patient. The first results of this study were reported in the volume *Drugs and Behavior*.[2] In theory meprobamate, a muscle-relaxant and "psychic soother," would be expected to increase the depth of sleep and thus keep the brain from reaching the stages of dream sleep. Whitman monitored the patient's dreams in the approved Kleitman fashion for eight nights. Then the patient was given 400 milligrams of meprobamate four times daily and monitored for nine nights. Because of the experimenters'

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conscious mind. With incredible rapidity, the mind constructs a situation to fit the noise or other disturbing influence. It is amazing what intricate details may be 'thought up' in this way even by persons who are not ordinarily very imaginative.

"In your case, there is a rather strong suggestion that the chase sequence is due to pain in your legs. Your mind, recognizing this pain, has you being chased to explain it. It would be a good idea to have studies made by your physician, to determine whether there is some physical cause of the pain. If there were no pain, you might still have this type of dream because of some frightening earlier experience, the lion representing perhaps an individual of whom you are afraid. The subconscious mind often uses symbols in reliving disturbing experiences."

[2] *Drugs and Behavior*, edited by Leonard Uhr and James G. Miller. New York: John Wiley, 1960.

unfamiliarity with the EEG apparatus and because the patient was awakened at 6 A.M., earlier than his usual rising time, Whitman and his colleagues recovered fewer dream narratives than would be expected on both the non-Miltown and Miltown nights. Despite these shortcomings it was shown that the dream cycle was not suppressed by the action of the drug.

Alcohol was equally ineffective. Dement once mixed himself a nightcap consisting of 90 cubic centimeters (the equivalent of three ounces, or three "shots") of pure alcohol, cut by a tall glass of orange juice. Then he pasted the electrodes to his scalp, downed the drink, and went to sleep. His dreams came through on time. But, as with all physiological rhythms, the dream cycle is not totally immovable. There is some evidence, from experiments still in progress as of mid-1961, that enough alcohol or drugs in the right combination (the stimulant Benzedrine taken together with the sedative Nembutal, for example) eliminates the dream cycle completely.

SLEEP DEPRIVATION, BRAINWASHING, AND WAKEATHONS

The first Benzedrine experiments were done in 1958, the year after Dement was graduated from the University of Chicago Medical School and came East to intern at New York's Mount Sinai Hospital on upper Fifth Avenue. At Mount Sinai Dement began co-operative experiments with Dr. Charles Fisher, the psychoanalyst whose interest in dreams has led to the rediscovery of the tachistoscope experiments (Chapter Three). The two men, Dement recalls, frequently "hashed over" the new dream discoveries. Dement told Fisher of his unsuccessful efforts to jar, shake, or break the dream cycle; Fisher wondered whether the cycle

might be affected by sleep-deprivation experiments similar to the kind that Dr. Kleitman had pioneered in the United States in the 1930s.

Sleep-deprivation experiments, however, were touchy enterprises. Staying awake three or four days not only required highly motivated volunteers but also courageous ones. During World War II over 100 Army volunteers at Camp Elliott, California, tried staying up as long as they could. After twenty-four hours all became irritable. After forty-eight hours many began to hallucinate; several who stayed awake ninety to one hundred hours developed psychotic symptoms. The experiments were repeated in 1956 and 1957 at the Walter Reed Army Institute of Research in Washington by research teams under the direction of Major Harold Williams, Chief of the Department of Clinical and Social Psychology. The Walter Reed experiments measured the effects of sleep deprivation on "psychomotor performance" —monitoring an instrument panel, pushing buttons when test patterns appeared, turning off flashing lights. The results of these experiments, which were described in part in an article by Gary O. Morris, Williams, and Ardie Lubin in the *A.M.A. Archives of General Psychiatry* for March 1960, showed how sleep deprivation took its toll. Even tough-minded volunteers, who made the sleepless experiments a competition of "guts," experienced strange moments —some dreamlike, some terrifying. After being up sixty-five hours, one man while washing up at a basin in the ward "saw" cobwebs clinging to his hands and face and tried—unsuccessfully, he said—to wash them off. Another claimed there was "hair in his milk" and refused to drink it. One man in every five reported feeling "a band of pressure" caused by a tight hat on his head. None, of course, was wearing a hat. But this didn't stop them from trying repeatedly to wrench

off the hallucinatory headpiece. After going ninety hours without sleep, one volunteer said:

"I just don't feel like the person I should be. I feel like a different person, altogether different. I just feel strange, completely, as a person. I thought perhaps it [I] might be somebody else; so I asked my buddies, and they said it was just myself."

In January 1959, about the time Dement and Fisher were talking over possible experiments to test the stability of the dream cycle, an opportunity appeared from an unexpected quarter. Inside a familiar New York City landmark, the glass-and-aluminum armed-services recruiting booth in Times Square, a disk jockey named Peter Tripp, age thirty-two, was trying to stay awake 200 straight hours as a publicity stunt for the annual March of Dimes fund drive. Tripp's wakeathon, for all its carnival atmosphere, was being carried out under serious scientific auspices. Because his employers, radio station WMGM, were concerned about the possible dangers of the experiment, they had asked the active assistance of Major Harold Williams, the army psychologist who had conducted the Walter Reed sleep-deprivation experiments two years before. Williams, in turn, had called in Dr. Louis Jolyon West, a former United States Air Force psychiatrist and the chairman of the department of psychiatry, neurology, and behaviorial sciences at the University of Oklahoma School of Medicine.

West's interest in sleep deprivation was somewhat different from either Williams' or Dement's. After the Korean War, West had interviewed several of the Air Force flying officers who had been "brainwashed" by the Chinese Communists into confessing that they had dropped "bacteria bombs" and had engaged in germ warfare against the North Korean civilian population. "Talking to these officers," West recalled recently to an interviewer, "I became convinced that

they were partially psychotic at the time they signed statements saying they were guilty. Otherwise it was hard to account for these 'confessions.' Neither drugs nor torture nor 'brainwashing,' in the original Chinese sense of intellectual recantation, were involved. Even the officers themselves wondered what had happened to them and why they signed."[3] Going over the notes of his talks with the fliers, West detected a recognizable thread. All the pressures of the Communist interrogations—the isolation of the prisoners, the cells brightly floodlighted twenty-four hours a day, the questioning around the clock—added up to a familiar laboratory situation. The men, he concluded, had been deprived of sleep. The deprivation had continued to the point of delusive behavior. After their interrogators had said, "Since you did drop germ bombs, why don't you admit it so we can stop this nonsense . . ." for what seemed like the hundredth time, the bewildered fliers began to believe they had, in fact, dropped the germ bombs.

When West left the Air Force, he did not put aside his interest in sleep deprivation and its attendant states of mental derangement. Shortly after he joined the University of Oklahoma faculty in 1954, West had an opportunity to observe two Oklahoma City radio announcers during a 168-hour wakeathon conducted in connection with the state's fiftieth anniversary. In the next year there was a rash of similar wakeathons and West became something of a specialist in these matters. It was natural, therefore, for radio station WMGM, through Williams, to invite West to New York for Tripp's attempt to shatter all existing stay-awake records.

[3] A perceptive essay on Chinese "brainwashing," together with an extensive bibliography of articles on totalitarian interrogation techniques, can be found in the article "Brainwashing, Conditioning, and DDD (Debility, Dependency, and Dread)" in the journal *Sociometry* for December 1957. Another valuable work is Eugene Kinkead's *In Every War But One*. New York: W. W. Norton & Co., Inc., 1959.

West agreed to participate provided (1) Tripp understood the dangers involved, and (2) Tripp's personal physician was on hand with final responsibility for his patient's health. In return West agreed to keep his experiment open to the press and the gawking pedestrians of Times Square.

THE ORDEAL OF PETER TRIPP

The New York newspapers gave Tripp's wakeathon good coverage. One of the most interested readers was William Dement. He armed himself with reprints of his papers that had appeared in scientific journals ("so they wouldn't think I was some kind of crackpot") and set off by subway for Times Square. Both West and Williams, it so happened, were already familiar with Dement's dream work. They readily consented to his proposal for attaching electrodes to Tripp and monitoring his sleep when the experiment was over. Thus three important lines of inquiry—sleep-deprivation experiments, the whys of "brainwashing," and the meaning of the dream cycle—had converged.

Tripp's progress toward the 200-hour mark predictably followed the patterns of the earlier Walter Reed sleep-deprivation ordeals. After three days of alternately spinning records and submitting to a battery of medical checks, Tripp began laughing at things that were not funny at all and taking offense at imaginary slights. Then came hallucinations: paint specks on the record turntable desk seemed like insects; a doctor's tweed suit looked like crawling worms. Finally he had delusions: he imagined he was broadcasting from another building across town; he thought the 200-hour mark had been passed but that West and Williams were tricking him to keep the experiment going. Tripp, said West, was suffering from "gross mental illness."

After 200 hours Tripp, his eyes bloodshot and his skin sallow, was taken across the street to a specially prepared suite in the Hotel Astor. The business of attaching EEG electrodes and making still another set of medical checks consumed another hour. Finally, after being awake 201 hours and thirteen minutes, Tripp fell asleep. West predicted he would sleep "the deepest sleep in history." Dement expected him to descend into a trough of sleep so deep that the dream cycle would, at the very least, be suppressed. Tripp slept—for thirteen hours and thirteen minutes. When he awoke his first words were, "I feel fine." He asked for a cigarette and the newspapers. After further checks his watchers pronounced him "vastly restored to his usual self."

It was a remarkable demonstration of the time-honored energy-restoring role of sleep. Totally unexpected, however, was the pattern that Tripp's brain waves had traced on Dement's EEG machine. Tripp's sleep was neither extraordinarily deep nor was it dreamless. The record showed that just forty minutes after Tripp fell asleep, he was dreaming. Even taking into account the fact that he had slept at least five hours longer than usual, his dream time as measured on the EEG was still far above the normal 20 per cent. In all, Tripp spent three hours and forty-six minutes dreaming, 28 per cent of his first restorative sleep in eight days. It was, a surprised Dement conjectured, as if Tripp had been trying to make up for his lost dream time by crowding in some extra episodes as soon as sleep finally came.[4]

Both West, the psychiatrist, and Williams, the psychologist, were impressed. West went back to Oklahoma with some fresh insights and new ideas for relating the dream cycle to the earlier questions that had perplexed him. Williams offered to co-operate with Dement on further sleep-deprivation experiments at Walter Reed. As for Dement, he

[4] A detailed monograph on Tripp's experiences is now in press.

says he was "inevitably" led to ask himself certain rather fundamental questions. "Since there appear to be no exceptions to the nightly occurrence of a substantial amount of dreaming in every sleeping person," he reasoned, "it might be asked whether or not this amount of dreaming is in some way a necessary and vital part of our existence. Would it be possible for human beings to continue functioning normally if their dream life were completely or partially suppressed? Should dreaming be considered necessary in a psychological sense or a physiological sense or both?"

NIGHTS OF DREAM DEPRIVATION

To answer these questions, Dement arranged a direct and drastic means of depriving sleepers of their dreams and observing what happened. He worked with a group of eight paid volunteers, including an unemployed actor, office workers, and students. All were carefully kept unaware of the true purpose of the experiment. Each was wired up in the usual fashion and allowed to sleep undisturbed for as many as eleven *base-line* nights. The only change in the usual procedure was an insistence that they abstain from any afternoon naps or cat naps. These base-line nights helped establish, in Dement's terminology, the Total Sleep Time (TST) and the Total Dream Time (TDT). On the average, the TST for the eight subjects was seven hours and two minutes; the average TDT was eighty-two minutes, or 19.5 per cent of the night.

Next came the *dream-deprivation* nights. Dement followed the slowly turning drum minute by minute. When the EEG pens signaled the emergence of the dream, Dement would sound the bell and rouse the sleeper before the dream could unfold. The sleeper would be required to sit up as

Dement engaged him in some plausible conversation for a few moments to ensure complete awakening; then the subject was allowed to go back to sleep. Throughout the night, whenever the curtain of the dream act started to rise, the bell would spoil the show. Not all of it, however—because Dement had to make sure that the emerging record was indeed the beginning of a dream act, sometimes as much as one or two minutes of dreaming took place. The dream deprivation was therefore not total, a fact that proved quite important as the experiment continued. Dement arbitrarily planned to hold the number of these dream-deprivation nights to five, to follow consecutively right after the base-line nights. This consecutive deprivation was critical. Together with the injunction against daytime napping, it meant that there could be no "catching up" on dream time during the period of the experiment. It also meant that the monitoring task, a one-man vigil in any case, was an arduous and demanding one. Dement's first series of tests ran to more than 2500 monitoring hours, or 362 subject nights. Since he was the sole electrode paster and equipment checker, as well as the monitor (and could not be relieved of certain administrative duties or his personal duties as a husband and father), his own TST was minimal for most of 1959.

Dement's findings could not have been more clear-cut. Subject A is typical. On his five base-line nights A averaged seven hours and twenty-seven minutes of sleep and one hour and twenty-four minutes, or 18.8 per cent of the night, of dreaming. (His range for total sleep time and total dream time and dream per cent are, respectively: seven hours and four minutes to seven hours and fifty-eight minutes; one hour and seven minutes to one hour and thirty-eight minutes; and 15.4 per cent to 21.8 per cent.) On the first night of dream deprivation seven awakenings were necessary to dissipate the emerging dream. After each awakening the cycle resumed

its normal course. Thus when A returned to sleep, the EEG tracings showed that a new sleep cycle immediately commenced. He went from Stage I through Stage II to III to Stage IV back down the trough and then from IV to III to II to Stage I toward the crest. The next dream curtain rose approximately ninety minutes later, at the expected time. On the following nights, however, A made progressively more attempts to dream, and progressively more awakenings were necessary to prevent the dreams from taking place. On the second night A made ten attempts to dream. On the third night, seventeen attempts. On the fourth night, twenty-one attempts. Finally, by the seventh deprivation night (A had volunteered to go on for two extra nights), Dement had to make twenty-four different arousals, as A tried to get two dozen different dreams under way. Further, the EEG showed that as soon as A dropped back to sleep, he would immediately try to dream again.

What was true of A was true of the other dream-deprived sleepers: the more they were deprived of dreams, the more they tried to dream. The *recovery* nights following the dream deprivation nights demonstrated this conclusively. A and the others were allowed to sleep undisturbed on these nights, with uninterrupted opportunities for dreaming. On his first recovery night A slept eight hours and two minutes. Of this time two hours and forty-five minutes, or about one third of the night, was dream time—almost twice A's normal amount. On the second recovery night the pattern was repeated, as A slept seven hours and twenty minutes and dreamed two hours and twenty minutes. The conclusion was inescapable: A was making up for his lost dreams by doubling his dream time.

Next, to deal with the objection that this increased dreaming was really a result of the multiple awakenings, Dement ran *control* nights. This series exactly duplicated the pro-

gressive amount of awakenings of the deprivation nights except that the awakenings were made in the non-dreaming periods. During recovery nights following these control nights, there was *no* increase in dream time.

The other dreamers followed the general pattern set by A, although, of course, no two experiences were precisely alike. Some, like B, made only fourteen dream attempts by the fifth deprivation night; others, like C, attempted as many as thirty dreams by the fifth night. One subject, D, had downed several cocktails at a party before his first recovery night; on that night he showed no increase (a fortuitous but not unexpected demonstration of the effect of alcohol on dreaming). As a general rule, about five nights of increased dreaming usually followed four to five nights of experimental dream deprivation.

"A PRESSURE BUILDS"

"It is as though a pressure to dream builds up with the accruing dream deficit during successive dream-deprivation nights," Dement has observed, "a pressure which is first evident in the increasing frequency of attempts to dream and then, during the recovery period, in the marked increase in total dream time and percentage of dream time." Dement and Fisher, who worked with Dement during the experiment, treated this "pressure to dream" with cautious respect. They were not sure what the motive force behind it was, except to think of it as some "quantity" or "psychic force."

Because of the uncertainty over possible adverse effects, Fisher interviewed the dream-deprived sleepers each day throughout the experiment. One subject found it too much to handle; he quit after three deprivation nights, Dement said, "in a flurry of obviously contrived excuses." Two others at first insisted on stopping after four deprivation nights

but agreed to go through with the recovery nights (they were told only there would be no more awakenings). In their daytime interviews with Fisher, the dream-deprived became noticeably tense and anxious as the experiment progressed; they had difficulties in concentrating, showed signs of fatigue, increased irritability, slight lack of muscular coordination, and had brief memory lapses. They also found it hard to remember the awakenings of the night before. One might argue that these changes in behavior were due to the multiple awakenings *per se*—after all, the subjects were not getting a good night's sleep in the traditional sense of uninterrupted slumber. But *none* of these observed changes was seen during the control awakening nights, which had also disturbed their sleep. And further, *all* of the symptoms of disturbance observed during the dream-deprivation periods disappeared as soon as uninterrupted dreaming was permitted again.

"The symptoms were not serious," Fisher subsequently observed, "but they might have been." Since the dream deprivation, as we saw, was partial, the subjects managed to get in about 25 to 35 per cent of their normal dream time. If Dement and Fisher had made the deprivation complete—totally suppressing even those first moments of dreaming—or had allowed the experiment to continue a few more nights, it is possible that, as Dement concluded, "a serious disruption of the personality would result." In some manner the operation of the dream cycle was essential to continued well-being.

DREAMING BY DAY

Dement made his first public report on the dream-deprivation work at the 676th meeting of the New York Neurological Society on November 10, 1959, and later pub-

lished some of his results in the journal *Science* for June 10, 1960. Dr. M. Ralph Kaufman, director of the psychiatric unit at Mount Sinai and a World War II Army Medical Corps doctor in the South Pacific, was chairman of the meeting. Dr. Fisher read a commentary. Dement's experiment, Fisher declared, "beautifully conceived and executed," cleared up a number of long-standing mysteries:

1. The Behavior of the Sleep-Deprived: The Camp Elliott GIs, the Walter Reed volunteers, the disk jockey Peter Tripp—all eventually cracked and exhibited gross psychotic behavior. Investigators were never sure quite why; one presumption was that it was a matter of fatigue and "weakening of the ego functions." Now, thanks to Dement, the hallucinations of the sleep-deprived seemed to have a better explanation, for prolonged sleep deprivation also results in severe dream deprivation. Then, in Fisher's words, "the dream deficit finally builds up to a point where the dreaming tendency breaks loose," first in visual illusions, next in delusions and hallucinations. From this point of view the visions of cobwebs, the crawling worms, the hair in the milk, the pressures of the nonexistent hat, the feelings of depersonalization ("I thought perhaps it might be somebody else"), the sense of disorientation ("We are broadcasting from another building across town") are all intrusions of the basic dream cycle into waking life.

In this connection West, checking back on his medical log of Peter Tripp's 201-hour-long wakeathon, found that after the third day Tripp's hallucinations came in cyclic episodes spaced about ninety minutes apart. In addition, the hallucinations were most intense after midnight and before 8 A.M.—the hours when Tripp was normally asleep and dreaming. West also checked back once again on the germ-warfare "confessions" extracted from the American aviators in Korea. Most of them, it turned out, were signed in the early

morning hours—again the hours when the fliers were normally asleep and dreaming. And chairman Kaufman, after hearing Dement's paper, was moved to observe that at last he understood "what that entity we called 'combat fatigue' in World War II was all about." As psychiatric consultant to the Tenth Army in the South Pacific, Kaufman had ample opportunity to observe combat infantrymen who had gone without sleep for two or three days and had broken down. Certainly, Kaufman said, the stress of combat played a role in the breakdown. But when the Americans advanced into the well-dug-in enemy emplacements, they found that the Japanese, despite all the shelling they had received, were calm and mentally sound. "We now can say," Kaufman added, "that our troops were dream-deprived while the enemy was sleeping—and dreaming—during the assault."[5]

2. The Relation of Sleep to Dreaming. In the past it was good biology to emphasize the body's "need to sleep." Freud had suggested that one of the functions of the dream was to preserve sleep by dealing with emotionally disturbing threats to the nightly rest. Now, with Dement's demonstration of a nightly "need to dream," the old notions of the relation between sleeping and dreaming may have to be changed. There seems to be, as Fisher points out, "a basic necessity to get in a fairly fixed amount of dreaming every night," or pay the price in mental and physical health. Thus, Fisher adds, "It may be said that, although Freud is correct in stating that the dream preserves sleep, in a more funda-

[5] Many people, of course, in many circumstances, manage on less than eight hours sleep a night for certain periods of time. Some bear up better than others. During the 1960 presidential campaign, for example, candidate John F. Kennedy seemed to thrive on an eighteen-hour day while those accompanying him were gray with fatigue. One possible explanation, in view of the Dement findings, can be found in Mr. Kennedy's sleeping arrangements. His campaign plane was equipped with a full-length bed, regular sheets and pillows, and pajamas. As a result the candidate was able to sleep—and dream—in conditions approximating his accustomed habits.

mental sense sleep preserves the dream—that is, it permits the discharge of the basic dream cycle."

Dement's dream-deprivation experiments, with their scientific rigor and careful regard for objective controls, have proven there is a need to dream. On this there is no dissent. But the specific nature of this need to dream is still a matter of sharp disagreement among scientists. When Dement undertook his experiment, he asked himself whether dreaming was a physiological necessity or a psychogical necessity, or both. On the basis of his experiments the question can be put more specifically: is the basic need to dream satisfied by the *process of dreaming*—that is, by the nightly ninety-minute quota of dreams—or is this need satisfied by the *dream content*—that is, what is being dreamed about during each episode?

CHAPTER EIGHT

The Need to Dream: 2. Explanations

The Dream Screen · The Night-eating Syndrome · Sensory Deprivation—Awake · 1. Minds Adrift · 2. The Dead-man's Float · Sensory Deprivation—Asleep · Found: The Waking Center · The Dream Habit · Ultimates and the Illusion of Finality

Mr. X was overeating, drinking too much, and smoking excessively. At the office he flared up irritably, particularly at older, matronly women. When Dr. Charles Fisher interviewed him, X was full of hostilities and resentments. He was jumpy; his reflexes were off. He had gained almost five pounds in one week; at night he even dreamed of food.

What exactly was troubling X? The simplest explanation was that X was suffering from "dream deprivation"—a

strange malady he had contracted during Dr. William Dement's experiments at Mount Sinai Hospital in New York City. Most of the seven other dream-deprived subjects showed the same symptoms during the deprivation nights. On the basis of these observed changes in behavior, Dement and Fisher had concluded that a certain amount of dreaming is necessary for a normal adult's continued physical and mental well-being; dreaming seemed to "give immunity" in some way against the virus of psychosis. Of all the symptomology of dream deprivation, one observation stood out: several of the dream-deprived developed a ravenous appetite and showed steady weight gains. When Fisher analyzed the transcripts of the abortive dreams and the fragmentary dream beginnings recorded by Dement on the deprivation nights, he found an abnormally high percentage of what he calls "oral dreams." Mr. X, for example, reported these typical dream beginnings:

I was drinking a glass of wine . . .
I was eating noodles and meat balls . . .
I was tossing peanuts in the air and catching them in my mouth . . .

One fourth to one third of the dream fragments recorded were along these lines. For comparison, one oral dream in every ten dreams was the usual ratio that Fisher found in a search of psychoanalytic case histories. The appetite, the weight gain, and the oral dreams all added up, in Fisher's mind, to a more complex explanation of what was troubling X and the other dream-deprived subjects. For this explanation Fisher turned to Sigmund Freud and certain psychoanalytic propositions about the link between sleep, dreaming, and the nursing situation of infancy.

THE DREAM SCREEN

The proposition goes something like this: early in life it may happen that when the infant is hungry and wants to be fed, the mother is otherwise occupied and cannot or does not come. The baby may cry or, alternatively, the baby may recall earlier memories of the breast or of bottle feedings. This memory is raised to "hallucinatory intensity," temporarily satisfying the hunger, and at the same time discharging "large quantities of oral-drive tension." Historically, then, the nursing situation is the "dream screen"—the backdrop and the first topic of the dreams of the individual. This special context influences and shapes all future dreams.[1] When men and women are dream-deprived, they are unable to discharge their infantile oral tensions; hence the irritability (like the crying baby) and the excessive eating, smoking, and drinking. Hence, too, on the "prehistoric" level, Mr. X's resentments against the maternal women at work.

To those unaccustomed to thinking in psychoanalytic terms, the notion that the dream originated as a substitute for breast feeding places a somewhat severe strain on credulity. There are other bits of evidence, however, that Fisher has cited in his comments on the deprivation experiments. Consider, first, the strange case of Mr. Y, another dream-deprived subject. Like the others, Y showed the same increase in dream starts on the deprivation nights. But, unlike the others, he wasn't hungry during the period of the deprivation nights, nor was he a weight gainer. Further, he was the exception to the rule that deprived dreamers show

[1] The idea of the "dream screen" was proposed by Dr. Bertram D. Lewin in "Sleep, the Mouth, and the Dream Screen," *The Psychoanalytic Quarterly* XV, 1946, and in "Inferences from the Dream Screen," in the *International Journal of Psychoanalysis,* 1948.

a large increase in dream time on the first recovery night. And, finally, the dreams he reported on the recovery nights had almost no oral elements in them.

Y, on the face of it, seemed to upset the slender accumulation of observations upon which the orality theory rested. But Y, it turned out, went to sleep on the first recovery night with a huge wad of gum in his mouth. He chewed it periodically throughout the night. The next day Y's appetite at last began to increase and he started gaining weight. Fisher conjectures that Y, a "neurotic subject with serious oral conflicts," had been much occupied with eating during the dream-deprivation nights but had managed to repress his hunger. The gum chewing during recovery nights and the "ravenous" eating during recovery days, by helping ease oral tensions, perhaps prevented the expected compensatory dreaming.

THE NIGHT-EATING SYNDROME

A second bit of supporting evidence comes from an entirely different field of research, the University of Pennsylvania's "obesity project," headed by Dr. Albert Stunkard. Overweight, though not an exclusively American problem, has reached epic proportions among an estimated one in every seven adults in the United States. In his investigations of these overweight persons, Stunkard had found three distinct patterns of compulsive eaters: the binge eaters, who devour mountains of food during times of stress; the unsatisfied eaters, who are unable to stop once they have started; and third, of direct relevance to the dream-orality theory, the night eaters. This latter group suffers from insomnia and therefore raids the refrigerator all night long; in the morning they are repulsed by food. The night-

eating syndrome, Stunkard reported in the *Psychiatric Quarterly* for Spring 1959, occurs during times of emotional stress and is often alleviated when personal problems are resolved. Viewed in the light of the dream-deprivation experiments, Stunkard's insomniac night raiders could be regarded as people who are missing their normal quota of dreams and are making up for it by eating. A good night's sleep, and its corollary, a good night of dreams, thus becomes a previously unsuspected remedial measure to combat overweight, at least in some cases.

Third, certain physiological evidence also appears to strengthen the suggested connection between Freudian oral drives and the basic dream cycle. The precise time when babies begin to dream is still uncertain. But Dement and the other young fathers among the dream scientists have monitored their own infant sons and daughters and determined that the Stage I EEG and rapid-eye-movement patterns begin to emerge sometime between the third and sixth months of life. A number of other patterns appear for the first time during this same period: certain brain rhythms indicating the maturation of the visual apparatus are noticeable; the infant begins sleeping through the night; night feedings are less frequent; and, finally, thumb-sucking begins.

On the basis of these patterns Fisher returns to the classic Freudian idea of the dream as a means of discharging sexual and other infantile drives, pre-eminently the oral drive. In infancy, so the theory goes, the baby is able to sleep through the night without bottle or breast because of the substitute gratification of thumb-sucking, enhanced and made more pleasurable by an accompanying dream of the real thing. In the adult the nightly dream cycle provides the pleasurable release of these primitive pressures in a hallucinatory manner. The suppression of the dream cycle, either in sleep-deprivation or dream-deprivation experiments, dams up this

pressure—up to a certain breaking point. When this point is passed, the pressure bursts into consciousness or waking life: the mind is inundated by distorted images; the senses are befuddled; perceptions are blunted. The normal operation of the dream cycle, on the other hand, regularly drains off these pressures before they build up dangerously. The dream, by permitting, in Fisher's words, "each and every one of us to go quietly and safely insane every night of our lives," helps preserve the mind and ensure daytime sanity.

By no means do all dream investigators share this neo-Freudian view of the need to dream. A second view holds that the recurrent dream cycle may be necessary in order to provide a regular source of stimulation for the mind during sleep. Whereas Fisher would say that the dream *permits* the mind to go insane every night, this second school would say that the dream *prevents* the mind from going insane every night. This explanation evolved not from theory, but from experiments conducted since 1951 in a new area of research called sensory deprivation.

SENSORY DEPRIVATION—AWAKE

We all recognize the advertising image of the busy executive: in his suite phones are jangling, papers requiring action flood the "In" box, and a secretary is taking dictation. The harassed housewife is his female counterpart; the advertisement usually features a crying baby, youngsters tracking across a newly scrubbed floor, and dishes piled high in the sink. *He* usually suffers from upset stomach; *she* has a splitting headache or "morning backache." In extreme cases, the ads tell us, both are candidates for a "nervous breakdown." But what both are suffering from, to the extent that the pictures are true, cannot be remedied with an aspirin or

a pill. Each has too many things to do. To use the phrase borrowed from computer electronics, each is suffering from input overload. The opposite of this overload condition, the *lack* of input, produces much more rapid and serious, though less familiar, mental disorders. These effects were demonstrated for the first time experimentally by the Canadian psychologist Donald O. Hebb at McGill University in the mid-1950s, and were summarized at a symposium on sensory deprivation held at Harvard Medical School in June 1958.[2]

Isolation from the normal amount of sights and sounds, of course, is not a new phenomenon. Mystics and holy men of all ages and religions have deliberately sought to eliminate, or withdraw attention from, their external environment in order to permit "visions from within" to emerge into awareness. I am indebted to Mr. Aldous Huxley for calling to my attention Saint Anthony of Egypt as an early example of sensory deprivation. According to Butler's *Lives of the Saints,* Saint Anthony was a hermit Christian abbot of the fourth century A.D. who secluded himself in a desert cell, slept on a rush mat on the bare floor, and ate only bread or water at sunset once or twice a week. Manual labor, prayer, and reading were his sole occupations. During this hermit's existence, "The Devil assailed Anthony by various temptations." A woman was sent to seduce him; a Negro appeared to terrify him. He was harassed day and night with "gross and obscene imaginations," the majority so personal and threatening that Saint Anthony never revealed their nature. (Saint Anthony's Temptations, as visualized by the terrible and grotesque genius of the fifteenth-century Dutch painter

[2] The proceedings have been published as *Sensory Deprivation,* Cambridge: Harvard University Press, 1961. The editors are Philip Solomon, Philip E. Kubzansky, R. Herbert Leiderman, Jack H. Mendelson, Richard Trumbull, and Donald Wexler.

Hieronymus Bosch, hangs today in the Museum of Fine Arts, Lisbon.)

More recently, and less mystically, the impoverished environment of the holy man has been duplicated in the air age. Lone aviators on long-distance or high-altitude flights have reported seeing apparitions, hearing "Lorelei-like" voices, and feeling as if they were "in a dream." The "Lone Eagle," Charles A. Lindbergh, described some of these sensations in his autobiography. Similar reports have become more numerous with the advent of the high-performance jets, which fly so high at times that the earth below is obscured or made invisible by cloud decks for long periods of time. At the Harvard symposium Dr. A. M. Hastin Bennett of the Royal Air Force Institute of Aviation Medicine, Farnborough, described some examples of the consequences of sensory deprivation in jet flights. One R.A.F. pilot, returning to his base in straight and level flight at 20,000 feet after an uneventful training sortie, reported:

"The feeling I had is difficult to explain. I felt as though I were dreaming and could not understand that I was in an aircraft. . . ."

Another pilot was flying a bomber at 25,000 feet altitude. The only other crew member was out of sight and there was little communication between the two. The horizon was hazy, and there was a little wispy cloudiness. He had been flying two hours and twenty minutes "straight and level." He suddenly felt faint:

"[I] seemed to be seeing things through a tunnel . . . did not know where [I] was . . . nothing had any meaning . . . I felt pushed along at altitude in a bubble out in front of the aircraft."

Both English pilots panicked but each managed to descend and land his jet safely. In the United States psychologist Brant Clark and Navy Captain Ashton Graybiel also found

the experience common among U. S. Navy and Marine Corps fliers on long-range missions. Graybiel named it the "break-off effect"—that is, a feeling of detachment and separation from the earth. The break-off effect usually appears when the aviator is flying alone at high altitude and has very little to do. Since he is strapped in his seat, he cannot move about. He cannot see the swept-back wings or the nose of his plane. The background noise of the motors and oxygen system is monotonous. Outside his canopy is the unchanging vista of sky. Quite literally he is almost out of this world, his flight a preview of what the first space men may face on the long years' journey to the planets.

Other recent studies at Harvard University and in France suggest that the break-off effect is not only confined to high-flying pilots but may also be fairly common among long-haul truck drivers. After several hours of turnpike travel some drivers have reported "seeing" giant red spiders crawling on their windshields; others have reported nonexistent animals running across the road. How many airplane crashes or highway accidents (or railroad mishaps) are attributable to such prolonged sensory monotony is a matter for research. Less immediately pressing but equally important, there is the problem of protecting future astronauts from the consequences of isolation.

1. MINDS ADRIFT

When Professor Hebb and his colleagues decided to recreate sensory deprivation in the laboratory, they made the impoverished environments of the mystic and the pilot seem, by comparison, busy and eventful. Their guinea pigs were male college students. The students were isolated in a 4- by 9-foot cubicle. Insofar as possible, all patterned sensory

stimulation was cut off. The cubicle was kept brightly lighted around the clock. A translucent plastic visor covered the student's eyes; he wore cotton gloves and cylindrical cardboard cuffs that extended from the elbow beyond the finger tip in order to immobilize his sense of touch. The constant hum of an air conditioner masked small noises. Inside the cubicle was a comfortable bed. The student was instructed to lie on it with his head cradled on a U-shaped foam-rubber pillow. He was told he would be paid $20 for each day he stayed in the cubicle.

The first and most striking observation made by Hebb and his associates, Woodburn Heron, W. H. Bexton, T. H. Scott, and B. K. Doane, was that their subjects, as they lay in isolation, were unable to think clearly about anything for any length of time. During the first few hours the students tended to dwell on current matters—their academic courses, the experiment, their girls. Then their minds drifted into the past, to thoughts of their families, their early school days, the details of old motion pictures they had seen. After a few hours in the isolation chamber some students reported that it took "too much effort to concentrate." They became content "to let their minds drift." Several reported "blank periods" when they did not seem to be thinking at all. Within seventy-two hours, in some cases sooner, the students began to "see images." According to Heron, one man repeatedly saw a vision of a rock shaded by a tree; another kept on seeing pictures of babies and could not get rid of them. Several reported they seemed to be "having dreams" while they were awake. Here is how Heron described this "dreaming while awake" in an article in the January 1957, issue of *Scientific American:*

"Our subjects' hallucinations usually began with simple forms. They might start to 'see' dots of light, lines or simple geometrical patterns. Then the visions became more

complex, with abstract patterns repeated like a design on wallpaper, or recognizable figures, such as rows of little yellow men with black caps on and their mouths open. Finally there were integrated scenes: *e.g.*, a procession of squirrels with sacks over their shoulders marching 'purposefully' across the visual field, prehistoric animals walking about in a jungle, processions of eyeglasses marching down a street. These scenes were frequently distorted, and were described as being like animated movie cartoons. Usually the subjects were at first surprised and amused by these phenomena, looked forward eagerly to see what was going to happen next, and found that the 'pictures' alleviated their boredom. But after a while the pictures became disturbing, and so vivid that they interfered with sleep. Some of the subjects complained that their eyes became tired from 'focusing' on the pictures. They found sometimes that they could even scan the 'scene,' taking in new parts as they moved their eyes, as if they were looking at real pictures.

"The subjects had little control over the content of the hallucinations. Some kept seeing the same type of picture no matter how hard they tried to change it. One man could see nothing but dogs, another nothing but eyeglasses of various types, and so on. Some subjects were able to realize visions of objects suggested by the experimenter, but not always in the way they were instructed. One man, trying to 'get' a pen, saw first an inkblot on a white tablecloth, then a pencil, then a green horse, finally a pen.

"The hallucinations were not confined to vision. Occasionally a subject heard people in the 'scene' talking, and one man repeatedly heard a music box playing. Another saw the sun rising over a church and heard the choir singing 'in full stereophonic sound.' Several subjects reported sensations of movement or touch. One had a feeling of being hit on the arm by pellets fired from a miniature rocket ship he saw;

another, reaching out to touch a doorknob in his vision, felt an electric shock. Some subjects reported that they felt as if another body were lying beside them in the cubicle; reported feelings of 'otherness' or 'bodily strangeness'; trying to describe their sensations, they said, 'My mind seemed to be a ball of cotton wool floating above my body,' or 'Something seemed to be sucking my mind out through my eyes.'"

While all this was happening, the experimenters observed the subjects through a viewing window. At first they were restless. Most went to sleep soon after they were placed in the cubicle. After awakening, they had increasing spells of restlessness, spells that grew progressively more unpleasant. They were by turns irritable and childishly silly; when they were led outside the cubicle to the toilet, they appeared dazed and confused and had trouble finding their way about the washroom. At some time between twenty-four and seventy-two hours, most of the students could not take any more, despite the twenty-dollar-a-day incentive.

2. THE DEAD-MAN'S FLOAT

Since the Hebb group's pioneering demonstration of the "sensory-deprivation sickness," other experimenters have repeated their results. Modifications have been made in the basic design to make the deprivation more complete. In some laboratories the toilet and a portable icebox were put inside the cubicle; at the Psychiatric Research Laboratory of the Boston City Hospital a coffinlike iron lung was used. In similar experiments at the Massachusetts Mental Health Center subjects wore earphones that restricted auditory stimuli to "white noise," a random mixture of sound. In late

1953 Dr. John C. Lilly, a neurophysiologist and psychoanalyst at that time on the staff of the U. S. National Institute of Mental Health, went beyond all previous sensory-deprivation situations in an exquisitely horrible experiment, which he described at an American Psychiatric Association symposium in March 1956 and subsequently published as an A.P.A. Psychiatric Research Report in June 1956.

Naked, except for a skin diver's breathing mask, Lilly suspended himself face down in a tank of water held at a tepid 94 degrees Fahrenheit. He could see nothing. He could hear nothing except for the monotonous lapping of the water and the faint creak of his breathing apparatus. His muscles and bones were in a near weightless state. In this "dead-man's float" position Lilly experienced many of the same sensations of Saint Anthony, the jet pilots, and the McGill students—but at an incredibly stepped-up rate, as if the same cinematographic track in the mind were being run at double speed for him. For the first forty-five minutes Lilly's mind was focused on current events and the experiment. After about two hours Lilly reported:

"One notices that one's thoughts have shifted from a directed type of thinking about problems to reveries and fantasies of a highly personal and emotionally charged nature. These are too personal to relate publicly. . . ." (Cf. Saint Anthony.)

Then, two and one-half hours after entering the tank, Lilly said, "the black curtain" that had been hanging in front of his eyes opened on what appeared to be a three-dimensional Technicolor motion picture. Small, strangely shaped objects with luminous borders appeared; there was a tunnel bathed in blue light. When Lilly left the tank, he said he felt as if he had "just arisen from bed afresh" and "felt out of step with the clock for the rest of that day."

SENSORY DEPRIVATION–ASLEEP

A number of conclusions relevant to dream research have been drawn from this work of Lilly and Hebb, and from the studies of aviators and truck drivers. The first is that a monotonous, or stimulus-impoverished, environment has definite, deleterious effects on the brain and behavior. This "exposure to nothing" can be prolonged and mild, as in the case of the high-altitude jet pilots; or it can be short and complete, as in Lilly's dead-man's float. Stating the same conclusion positively, it seems that a certain quantitative level of stimulation is necessary to insure the normal functioning of the brain. "Variety is not the spice of life. It is the very stuff of it," Heron approvingly quotes the words of Christopher Burney, the World War II British Army spy who was captured by the Nazis and kept in solitary confinement for eighteen months.

Second, the state of experimental sensory deprivation resembles in many respects the state of normal sleep. Outwardly there is the same minimum of stimulations. When the sleeper goes to bed he isolates himself, opens the window just enough to get an even atmosphere yet keep out the sounds from his neighbor's television set, and lies as comfortably as possible in a darkened room. Inwardly, after he has closed his eyes, the nocturnal mind drifts through the same sequence of current themes, reveries, "blank periods," and visions that was reported by the McGill students and by Lilly. In fact, so pronounced is this similarity that Lilly reported he felt he had just awakened from sleep upon leaving the tank.

Third, the brain-wave patterns recorded in the McGill studies look identical to the distinctive brain-wave patterns

traced during dreams. Their visions were also dreamlike. Thus, physiologically as well as psychologically, the hallucinations of the sensory-deprived and the nightly dreams of ordinary sleepers seem to be similar mental states.

On the basis of these observations, some investigators have speculated that the nightly dream cycle provides the needed sensory stimulation for the brain. If the waking brain regularly requires a certain level of stimulation and spice, they reason, then the sleeping brain may also have the same need. In that profoundly stimulus-impoverished state known as sleep, this need for stimulation may be met by the recurrent dream cycle throughout the night; the four to six dreams at regular intervals would be a nighttime substitute for the normal day's "sensory bombardment" from the outer world.

FOUND: THE WAKING CENTER

This all fits in with the newest neurological findings, especially those made by Dr. Horace Magoun and his associates at the School of Medicine, University of California at Los Angeles. In the late 1940s and early 1950s Magoun showed how the reticular formation (from the Latin word *reticulum*, a diminutive of *rete*, or net) regulates important higher mental activities. Anatomically, the reticular formation is a nerve net in the brain stem, that fist-shaped extension of the spinal cord into the brain. Neurologically, the reticular formation is connected to the high centers of the brain by ascending nerve fibers which carry impulses from the ears, eyes, muscles, and other sense organs to specific control areas in the cortex. It is also connected by other pathways to lower brain centers and the central nervous system. Functionally, Magoun and others have found that the reticular formation acts as an "arousal," or wakefulness,

center, boosting the ascending sensory signals to a higher intensity. These pathways are not one-way streets, however. The wakefulness center not only radiates impulses upward and downward, but is itself alerted by signals from either direction. In addition to this general alarm system, the reticular formation apparently has learned how to be selective; and of all the stimuli clamoring for attention and for routing to higher levels, the reticular formation disregards some in favor of others. The sleeping mother, for example, hears the baby's faintest whimper while father may sleep through a night of wailing.

The normal operation of the brain, it now appears, depends upon a continuing arousal signal generated within the reticular formation. This generation is, in turn, dependent upon a constantly alerting sensory bombardment from the outside. The monotony of an unchanging environment, as Heron sees it, fails to provide the required amount and variety of this stimulation for the reticular formation; and the reticular formation, for its part, fails to generate the arousal signal. As a result, the complex neural organization necessary for thought is impaired. During sleep, the needed variety of stimulation would be provided by the dream. Sleep comes as the reticular formation shuts out from the higher brain centers the sensations streaming in from the outside world. But there are internal sources to draw from—the older sensations and previous experiences of the visceral brain and of the memory. From this storehouse comes the needed stimulation to keep the rest of the brain in working order.

This explanation of the need to dream could help account for a number of facts. Dr. Allan Rechtschaffen, a young dream researcher at the University of Chicago, has listed some in a spirit of speculation only:

1. The lengthening of the dream acts as the night progresses—from the point of view of the sensory-stimulation

theory of dreaming, this lengthening could be interpreted "as an increased need for self-stimulation by dreaming, as the reservoir of stimulation built up during the day's activities is depleted."

2. Body movements during the night—Kleitman, Dement, and Wolpert found that while there is a fair amount of tossing and turning at night, the sleeper is usually quite still during dream periods. Rechtschaffen suggests that when the sleeper provides his stimulation in the form of dream imagery, there is no need to produce tactile stimulation by moving his limbs or changing body position.

3. Nightmares—in terms of the sensory stimulation hypotheses, the nightmare could be a case of *too much* stimulation.

There are plans to test these theories in a number of ways. For example, one can play a tape recording of varying auditory stimulation just below the level that would awaken the sleeper and see whether there is a decline in the number and length of the night's dreams. Another technique would be to change the normal sensory stimulations of the day—either by arranging a form of over-input or under-input, or by intensifying the emotional quality of the stimulation—and observe the effects on dream time.

THE DREAM HABIT

Both the psychoanalyst's "safety-valve" theory and the psychologist's "sensory-storage" theory assign the dream the same critical function: keeping the brain in working condition. In the "safety-valve" view, the dream lets the mind go insane nightly; in the "sensory-storage" view, the dream gives the mind periodic exercise. There is, finally, a third view, held by Dr. Nathaniel Kleitman, the man who made

all this work possible. He holds that dreaming may have no function whatever. Like nocturnal sleep, Kleitman argues, dreaming is a habit acquired by the infant as he develops—a process "that is neither good nor bad, neither right nor wrong."

At birth the baby is, for all practical purposes, an animal without a cortex. He sleeps, as we saw, more than he stirs. To rouse him from this near-vegetative state is the earliest and major function of the reticular formation. In Kleitman's words, this arousal takes place when a stimulus—for example, an internal need like hunger or an external annoyance like a wet diaper—"is strong enough to irritate the wakefulness center, disrupt the somnolent state of the organism and usher in the animalistic activities required to cope with the situation." While this is going on, the brain reaches that low level of conciousness—or high level of sleep—at which dreaming can take place. In the first months of life this primitive dream-wakefulness lasts only so long as the need is unsatisfied; fed or changed, the baby returns to the original state of dreamless sleep.

Later, as the cerebral cortex develops, the baby learns the diurnal pattern of sleep and activity and adds long periods of social wakefulness to the basic cycle. Originally this cycle of rest and activity occurs about every fifty or sixty minutes. The timing mechanism, or "biological clock," that paces it is as yet unknown. But as the child grows older, the cycle lengthens to about ninety minutes, in line with other basic physiological rhythms in the body, such as the cardiac cycle, the respiratory cycle, and the gastric cycle. As in these cycles, the clock of sleep-activity ticks twenty-four hours a day. At night the old primitive rhythm waxes and wanes in the sleeping adult; as a matter of habit, dreaming continues to alternate with deeper sleep. During the day the great upsurge in cortical activity obscures the underlying

cycle, although it still can be discerned in the everyday variations in alertness that we all feel, such as the midafternoon pickup we feel after a cat nap, or the drowsiness after a meal. Under the extreme conditions of a sensory-deprivation experiment, the old pattern may break through into consciousness.

From this physiological standpoint, Dement's dream-deprivation experiments can also be explained. The Dement experiments, Kleitman has suggested in an article in the November 1960 issue of *Scientific American*, represent interference with an acquired habit that is no different from other habits, such as eating sweets or smoking. Persons with a sweet tooth who are deprived of sugar might become as irritable and upset as Dement's dreamers were when deprived of their dreams. After their sugar supply is restored, they might consume extra or excessive quantities of candy or sweets for a time, just as the dream-deprived made up for their "missed" dreaming. In the first days of the Normandy campaign this actually happened among some combat troops fresh from training in the United States: the Army's emergency chocolate ration, the "D" bar, was selling for five dollars among suddenly sweet-deprived soldiers. Similarly many smokers testify to the same irritability when they decide to cut out cigarettes.

Here, then, are three possible explanations for the need to dream. To say that each is in controversy is not to say that each is in conflict. All three may supply pieces to the total complicated, and still-emerging, puzzle of sleep and dreams.

To some degree Kleitman and Fisher complement each other. The sleep-activity rhythm, for example, seems to account for the spacing and number of episodes both in the normal nightly dream cycle and in the periodic hallucinations or "dreaming-while-awake" of the sleep- or sensory-deprived. At the same time the beginnings of this nightly

process seem to coincide with the infant's hunger demands. This lends some support to Fisher's psychoanalytic speculations.

"Adult" dreaming may very well be, as Kleitman suggests, an acquired habit. But it doesn't follow from this that dreams have no function whatever. Calling a dream a habit, most dream scientists would argue, in no way minimizes its importance. Human speech is also an acquired habit, a secondary application of the primary process of breathing. As Kleitman himself has pointed out, the primary function of breathing is to meet the organism's respiratory needs—supplying oxygen and removing carbon dioxide. The modification and control of the expired air permits vocalization. Obviously breathing is more primary and more important than talking, but this hardly makes human communication an insignificant matter. So, too, with the sleep-activity rhythm and dreaming. The primary function of the rhythm —the why of dreaming—may be an animalistic arousing mechanism or a means of supplying stimulation. Or it may merely reflect hypothalamic activity. But once this state of physiological awareness exists, the cortex may seize it for its own purposes.[3]

ULTIMATES AND THE ILLUSION OF FINALITY

As with all scientific theories, these ideas will stand or fall on the results of further experiments. At the University of Oklahoma School of Medicine, Dr. Louis J. West, an experi-

[3] In this connection, Susanne K. Langer in her *Philosophy in a New Key* criticized the "utilitarian" doctrine which held that man's basic needs are the same as those of the lower animals, only much more refined. If this were true, she argued, then language would be much more realistic. There would be no magic, ritual, art, or dreams. But the mind, Miss Langer says, does more than connect experiential items; man has a need for symbolization as basic as the need to eat or move about.

mental psychiatrist of imagination and enterprise, has plans for some "ultimate" tests of these propositions. In one experiment volunteers will be hooked up with EEG electrodes in the prescribed Kleitman manner and then suspended "dead-man's-float" fashion in a John Lilly type of tank. Later the same volunteers will spend a more normal night in West's dream laboratory. The EEG and rapid eye movements recorded in both situations will be compared to determine with exactitude the extent waking hallucinations might resemble the hallucinations of dreams. In another experiment West will attempt to measure all the basic body rhythms—rest-activity, cardiac, gastric, respiratory, metabolic—at one time in one person twenty-four hours a day for several days.

Whatever West finds, one thing is certain: the theorists should still be in trouble. "Finality may always elude us," the physicist Werner Heisenberg once remarked. This is sure to be as true for the study of the mind as it is for the study of high-energy particles. As Professor Hebb of McGill put it, commenting on his own contributions:

"As to the theoretical situation, I am completely at sea. Clearly in psychology and neurophysiology, and, I believe, in the related fields of psychiatry and neurochemistry, there is occurring a major breakthrough in knowledge of the past ten years, and instead of making progress, I am still falling farther behind; the data and ideas are coming in too fast."

CHAPTER NINE

Dream Themes and Variations

The Variety of Dream Life · Continuity: Dreams in Sequence · The Vivid Flashback · Lateral Homology: The Particular Dream at a Particular Time · The Play of the Night · The Theme of Conflict · Dream Diaries and Dream Hotels

What goes on in a dream? What is the relation between the events in one dream and the other dreams of the night? Are they linked like acts in a play or chapters in a book? Or are they unconnected stories—one-acters and novellas, so to speak? Or are the same themes endlessly reenacted like the offerings of a limited repertoire company?

These questions were among the first that occurred to the Chicago investigators when they observed the dream cycle unfolding nightly on the EEG machines. But, necessarily, studies of the content of dreams had to wait until the moni-

toring methods were perfected. In the past, before the new view of dreams made possible by the Kleitman method, speculation about dreams in sequence had been rare, principally because few investigators had any idea there was any sequence to speculate about. One notable exception was Sigmund Freud, who suggested in *The Interpretation of Dreams* that multiple dreams during the night "may have the same meaning and may be giving expression to the same impulses in different material." Freud also remarked that the first dream of a pair "is often the more distorted and timid, while the succeeding one will be more confident and distinct."[1]

It is a tribute to Freud that these comments provided the point of departure for the first objective investigation of dream content using the new monitoring techniques. The results of this investigation, however, reveal patterns among the night's dreams far more complex and involved than Freud had imagined. Though these findings are the result of work in several laboratories, they may be grouped under six general headings: the richness of dream life; continuity, or dreams in sequence; temporal regression, or the vivid flashback; lateral homology, or the particular dream at a particular time; the play of the night; and the theme of conflict.

THE VARIETY OF DREAM LIFE

Drs. William Dement and Edward Wolpert at Chicago and later Wolpert, Drs. Harry Trosman, Allan Rechtschaffen, and William Offenkrantz were the first to monitor sleep in hunter fashion through the night to capture dreams in ripe, full-blown detail. Over seventy nights of dream transcripts,

[1] Freud gave as an example the two dreams of Pharaoh about the kine and the ears of corn which were interpreted by Joseph in the Bible.

running into hundreds of pages, revealed how richly detailed the dream really is. Before the monitoring techniques were discovered, dream stories were often fragmentary, pale, and disjointed accounts—the exception of the nightmare dream or the dreams of a dream virtuoso proving the rule (and even then the remembered visions of the nightmare or of the dream virtuosos failed to reflect adequately the ninety minutes spent in dreams during the night). The following dream transcript, reprinted with the permission of Dement and Wolpert, illustrates the detail of a typical dream:[2]

It started out with me telling somebody about a murderer. The murderer was supposed to be in this house. I was telling two detectives a rather lengthy story about this gruesome murder. The idea was to lock them up in this house with the murderer so they'd catch him. And my wife, or some woman who was somehow related to me, was supposed to leave. So she went outside and I locked them in. Just as I finished locking them in the house it occurred to me that this was a trick and the murderer was really this woman and she was having me lock the detectives in the house so she could get me. Just as I went running down the porch stairs this horrible knowledge dawned on me. I ran out into the yard and was kind of looking at the house. It was an old house that was up on a hill. The yard was kind of roundish. Suddenly she jumped out of the bushes and began running at me. She looked horrible. She was going to push me off

[2] This and the dream transcripts in the following pages are taken from the *Journal of Nervous and Mental Diseases* for 1958, and from the *A.M.A. Archives of General Psychiatry* for December 1960. Transcripts were also drawn from papers presented at a joint meeting of the American Psychoanalytic Association and the American Psychiatric Association in Atlantic City, N.J., May 1960, and the December 1960 midwinter meeting in New York City of the American Psychoanalytic Association.

the cliff—part of the hill was a cliff—or kill me somehow. Just before she got to me she changed into a tiger—a tigress. At the moment I woke up crying out.

The transcripts also reflect the variety of feelings in the dream life of any one night. Dreams recovered with the new techniques are as diverse as is waking life. They take place in automobiles, in houses, in dormitories, in swimming pools, and in lecture halls. There are dreams of wives, parents, children, old friends, and new business associates. Sometimes the dream transcripts are of ordinary episodes, similar to or perhaps repetitious of a previous daytime experience, as in these examples:

We [the dreamer and his wife] walked out of the theater with two other people. They went and got in their car, but we kept on walking. I just happened to see our car at that point. It was in a mud puddle and I had to go around to the other side to get to the door. The door seemed stuck and I was tugging at it when the bell went off.

I [married woman] dreamed I was eating lunch with a girl friend, and another girl friend came by, and we invited her in . . . we were discussing watching Bing Crosby playing golf . . .

Other times the episodes are quite bizarre:

I [a young man] am being chased by witches who have been released from boxes where they are imprisoned. At the same time I am chasing a girl. All this is very exciting.

It was in an apartment house and I [a young man] was the superintendent. There was this girl that had an apart-

ment, I was going to tell her that part of the house was going to fall down when she was in the shower, and then she'd come rushing out of the bathroom without any clothes and I'd stand there and look at her. It was stupid.

CONTINUITY: DREAMS IN SEQUENCE

Generally speaking, the dreams of a night were never perfectly continuous. Rarely were there dreams that took up the story line exactly where the previous dream had left off. The most smoothly integrated sequence reported to date was dreamed by a twenty-five-year-old student working toward a master's degree in mathematics. Prior to the experiment, he claimed that he had never recalled a dream in his entire life. He was characterized by the investigators as a rigid, bland, and stubborn person, whose only non-mathematical interests were ballet dancing and wrestling. He reported this series of four dreams one night:

1. I am in a garage cutting up wood to put on a truck to take away.
2. I am in the same place cutting up a door, getting it ready to throw out.
3. I am completing the work in the garage, carting off some things and breaking others that are too big to throw away; then I lock up the garage.
4. The garage was all cleaned out.

More typically, however, the separate dream acts of the night are self-contained stories with one or two elements in common. The connecting link might join the dreams as an automobile does in these successive dreams:

1. I was near a cherry orchard with lovely pink blossoms on the trees that looked sort of like pink pinwheels. Somewhere along the line I got the idea that I ought to hire out as a guide, give a sight-seeing tour. So I got my car and about that time along came a train across a bridge that was in the orchard. It went across the bridge and all of a sudden I realized that I was parked on the tracks and the train was coming toward me. I gunned the engine and drove ahead just in time to let it miss me. Then I turned around and drove back toward the orchard. There was quite a crowd of people and I wondered how one went about selling a sight-seeing tour. . . .

2. Somebody met me in a car. I got into the car and it started down the hill. As we drove, it seemed to become sort of a cliff with a lake on one side and the cliff rising up on the other. The street was terribly narrow. I was a bit worried at this point, but I thought that the driver ought to know enough to be able to stay on the road. . . .

Note also that these two dreams are linked by a common element of danger. Sometimes the link between successive dreams during the night is a trivial detail which stands out incongruously, as in the following two dream transcripts:

1. . . . I went inside and started going up an escalator; I could see my wife up ahead of me, four or five steps. The place was just mobbed. Then we were going down a hallway and I couldn't get to her. There were cakes of ice in the center of the hallway and people just milling in and out, everyone carrying suitcases and things. Then we started up this next escalator and there was a girl standing beside me. She had a real shabby suitcase . . .

2. . . . He was collecting big hunks of watermelon and I

thought I'd get a job helping him, so I started picking them up and some of them looked more like pieces of ice than they did like watermelon . . .

THE VIVID FLASHBACK

In their intensive monitoring studies, Trosman, Rechtschaffen, and Offenkrantz noted a distinct time pattern during the night's dreams. There are exceptions, of course, but the first dream of the night either tended to have a contemporary setting or was rooted in the dreamer's current concerns. One subject, Mr. Brown (a pseudonym), was thinking about his confused personal affairs as he fell off to sleep. Brown reported the following dream after the first awakening:

[I'm] telling the girl I'm interested in, who is married, that 'I'm annoyed at the necessary frustrations of this situation.' How it is just extremely annoying the curtailment of the amount of time we could be together. She retorted, 'That's why I'm so happy.' I was stunned, then suddenly realized this was in fact what I wanted to hear and felt very peaceful. Then I awoke in alarm.

A young housewife, call her Mrs. Smith, reported her first dream of the night had to do with cosmetics:

I remember a diagram and . . . another person. I don't know whether it was a man or a woman. We were discussing . . . night creams. And that's all.

Later in the night, however, usually after 4 A.M., the dreamer tends to return to a childhood or adolescent setting,

flashing back to earlier times the way a novelist may handle his material. By the third dream of the night, for example, Mr. Brown, the young man involved in the frustrating situation, had this dream from his grammar school years:

I was with another person called H . . . We were playing a game of trying to identify faulty bars of soap. We were kneeling down like playing blocks. I felt contented because my method for identification was a good one. H . . . was teaching me but there was no conversation.

Mrs. Smith, the housewife who was discussing night creams (an adult topic) in the first dream, had also slipped back to childhood by her fifth dream of the night:

Well, I dreamed I was at a party, with all the guests there old friends of mine that I had gone to grammar or high school with. We were all having a good time. We were dancing. Finally a stranger came up and asked me to dance. I was dancing with him and all of a sudden I remembered who he was. He was a friend I used to have a crush on when I was in grammar school, and I hadn't seen him for years.

Offenkrantz and Rechtschaffen noted in this middle-of-the-night shift a change in the dream locale to early visual memories. Again, toward morning, there is another shift in the location of the dream: once more the dreamer returns to current events. Mr. Brown reported toward morning:

This girl [the same one as in the first dream] and I were on the outs in the earlier part of the dream, and preceding waking up there was a reunion. I told her I was fed up and she didn't say a word, so then I kissed her. Presumably this

meant I did not believe what I had said. The dream had a legendary quality; almost done in pantomime. There was a feeling of detachment, like a playwright with the end perceivable.

And Mrs. Smith, the young housewife, is back on the job in her final dream of the night:

All I can remember about it is the fact that I was standing in the kitchen washing dishes, and at the same time I was sitting in the living room with a hose, sprinkling the floors. Then, besides all that, I was upstairs getting ready to go out.

LATERAL HOMOLOGY: THE PARTICULAR DREAM AT A PARTICULAR TIME

Trosman, Rechtschaffen, Offenkrantz, and Wolpert also noted a phenomenon they called "lateral homology," or the tendency for certain dream elements to recur at identical positions in the dream sequence or at similar hours on different nights.

One subject dreamed of a fat woman during the third dream of the night (and during no other dream) on three different nights. In one dream, for example, he reported that "a fat woman asks me to help her carry out the skeleton of a man who was half alive. I am unwilling to do so and suggest to her that she use rocket propulsion to get him out." In a second dream there is a woman whose weight increases with marriage. Another dreamer on two successive nights (1) watched an athletic event in the first dream, (2) was rejected by a friend in the second dream, and (3) freed a buried object in the third dream. Another dreamer, a white-collar worker, dreamed of the same friend (male) during

the *third dream* of the night on five different nights. On the sixth night the friend appeared in the first dream. However, that night the dreamer had arrived at the laboratory much later than usual, and the first dream of the night did not unfold until 2 A.M., *the hour at which his third dream usually occurred.* Another dreamer dreamed about a book with a French footnote during his second dream one night. Over two months later his third dream was about a book and a close relative whose given name was French. Several nights later the second dream was about a book and the same relative again.

A final example, one that sent a baffled Offenkrantz to Webster's Unabridged Dictionary, turned on the word "wherrying." A subject reported this dream as his second of a particular night (italics supplied):

I induced more comfort in what I was sitting or lying in by moving one part of it violently, *as if I were wherrying a joint* in an enclosed space. It happened twice; I moved both the upright and crossbar parts of the large armchair in my apartment. These are not normally moving parts, but I moved them. Doing this made the chair more comfortable. I was questioned on this issue and I defended it. I was conscious at the end of the dream of being in this bed and I was moving the headpiece to make it more comfortable, or was considering doing so.

The fourth dream of that night, the dreamer reported a dream act in four scenes (italics again supplied):

First Scene: Trick horses in a circus. I demonstrated riding. It was very vivid. A trick my horse could do was to raise both front legs off the ground six inches.

Second Scene: Landing off a barge onto an island for

another horse show. My horse again demonstrates its ability to lift its legs in order to get off the barge.

Third Scene: A horse groom was trying to get his horse off the barge. The water was now deeper. It seemed odd. The groom explained, "After you've made several landings, it won't be frightening." At this point my trickier horse had gotten off alone, showing off. It would have been logical to say, "I wish my horse were not so independent," but I said, "I wish my girl were not so independent." There was another horse with another owner. I didn't see them.

Fourth Scene: The show had become a shipwreck. We were on an island looking for a fresh-water spring. The first spring was polluted. There were deer on the island.

The dictionary lists "wherry" as either a noun meaning a barge or as a verb meaning to propel a barge. Offenkrantz commented, "The use of wherry is inappropriate in the second dream but appropriate to the image 'barge,' which appears in the scenes of the fourth dream." (A possible explanation for this is offered on page 206 of this chapter.)

The dream investigators can only speculate at present about the meanings of these various patterns of the dream link, the flashback, the vividness curve, and the particular dream at a particular time. One obvious explanation might be a physiological one; yet the patterns cannot be related to the varying depths of sleep during the course of the night because the dreams occurred in the same stage of sleep (although there is a possibility of varying "depths" within one stage). The body-temperature curve, another of the important but little understood physiological cycles that Kleitman explored, offers a rough parallel to some of these observed changes. Temperature usually proceeds steadily downward as sleep progresses, then begins to rise again just before the morning awakening. But there is no clear reason

why body temperature should be related to dream content.

There is a second possible explanation, less obvious, that Offenkrantz and Rechtschaffen have considered. As the night progresses and the sleeper spends more and more time away from the external stimulation of the previous day's events, they speculate, these contemporary affairs may become less and less important to him and lose their influence as "day residues." From this point of view the return to the contemporary scene in the final dream of the night would reflect an "anticipatory time sense"—much like the familiar one that apparently enables some sleepers to waken spontaneously at a desired hour in the morning. Coming back to the present thus prepares the dreamer to deal with the next day's waking problems.[3]

There are other conceivable (as of now) possibilities. Perhaps some psychologically predetermined "scheduling" of dream contents allots certain dream thoughts their time or place in the sun of the mind during the night. In this connection the vividness curves and visceral-turmoil curves observed by Dr. Frederick Snyder (page 135) match the temporal-regression curve observed by Offenkrantz. This would mean, Snyder has suggested, that the dreams of the night regularly sample different layers of the mind. Finally, and less metaphysically, there is always the possibility that a minimum recurrence of certain elements on any given night might be expected on the basis of chance alone. Several exceptions have been observed, for example, to the patterns of temporal regression and vividness. Some are given on the following pages. The curves then would be without any deep psychological implication at all. As Offenkrantz and Rechtschaffen

[3] If this is so, are dreams different on a weekend? That is, do the last dreams of Friday night–Saturday morning and those of Saturday night–Sunday morning prepare the dreamer for his weekend family responsibilities or for leisure activity, in the same manner week-night dreams prepare him to face the weekday work routine?

put it: "This would follow if one assumed that, at any given time, the range and variety of an individual's mental contents had finite limits, for then one would automatically expect that any 'scanning' process [at night] would be likely to result in the re-selection of certain manifest elements even if the scanning process were of a non-motivational, non-psychological nature."

While not ruling out this "end-of-the-line" possibility, the dream investigators have gone ahead on the twin assumptions that a) the dreams of the night have underlying psychological interrelations and that b) these links could be uncovered if the personal meanings of the dreams were better understood and interpreted.

THE PLAY OF THE NIGHT

Generally speaking, there are two contemporary approaches to the interpretation of dreams. One, the classic approach, insists that valid dream interpretations can be obtained only by a psychoanalytically trained therapist who elicits an ample number of free associations from his patient in order to get at the dream's hidden or latent meanings. The other approach, without denying the validity of intensive analytic dream interpretation, believes that the surface or manifest content of the dream is still valuable and worth studying. By comparison with the intensive analytic methods of dream interpretation, this technique might be called "instant interpretation."

In 1958, in the *Journal of Nervous and Mental Diseases*, Dement and Wolpert made the first instant interpretations of several dream sequences recovered by the new monitoring methods. They found that certain coherent themes seemed to thread through the transcripts. Looking at the entire play

of the night, Dement and Wolpert found that these themes were usually serious emotional statements, Sophoclean or Strindbergian, despite the light-comedy atmosphere of the individual dream episodes. Or, as Wolpert once explained to an interviewer, in Freudian terms "the manifest contents of five or six dreams of the night might add up to the one latent content of the night."

The five dreams in sequence of A, reproduced in full on page 14 in Chapter One, reminded Dement and Wolpert of the simple and inexorable development of *Hubris* in Greek tragedy. At first the dreamer is presented in a triumphant role; as the sequence progresses, he is vanquished by the very forces that were within his control. In the first dream of the night the dreamer has bested a woman adversary, topping her trump card. But by the second dream of the night he is no longer so certain of himself nor so brave (he runs away in fear of his shadowy friend, a figure who may represent the dreamer himself). By the third dream he is the passive sexual partner of Miss C and her friend. Later in the same dream episode he is the instrument of his own injury. Still later he seems to be trying to reassert his masculinity once again by assuming, vis-à-vis a boy, the traditional male role of the experienced hunter. But by the last dream the dreamer's reversal of position is complete: he is playing cards again with women, but his cards are "wrong" and he doesn't know what to do. The moral of this night's little tragedy, Dement and Wolpert concluded, might be stated, competition with women leads to destruction.

In another series of four dreams the dreamer was constantly angered by other persons in his dreams but managed always to keep from lashing back at them. In the first dream he was attending a lecture. He asked a question of the professor, but was rebuffed with a sneering remark. He became very angry but managed to control himself. In the second

dream he was talking to a male acquaintance. He made a remark to which his friend took exception. Again he was angered, but only made a few uncomplimentary remarks to his friend and then walked away. In the third dream he was working in a hospital and a nurse began to criticize him severely for some minor ineptitude in his work. Again he felt anger, but controlled it and confined himself to thinking, "What an old hag she is." In the fourth dream of the night the dreamer was eating dinner with his family. His mother wanted him to eat some leg of lamb but he refused. She began pleading with him and he began to get angry. Then, "She kept kissing me like a little kid and fishing for compliments on her cooking. I got fed up and walked out of the house."

Each successive dream of this subject, Dement and Wolpert concluded, more clearly expressed the "basic situation" on his mind, as the antagonist changed from a university professor to his mother—a shift consistent with a pattern of descent to "deeper psychological material" as the night progresses.

Another series of five dreams seems to be joined by the common theme of violence and conflict. The sequence:

Dream 1. We were swimming and doing a lot of things. Everybody was in bathing suits at the swimming pool and I seemed to be admiring my body all the time. . . . I climbed out and there was some guy sitting there who I immediately disliked. He seemed to epitomize all the guys who make asses of themselves parading around in bathing suits who I grudgingly admit do look good in bathing suits, but who are conscious of it. And he was oiling himself. Anyway, it seemed as though I was afraid that my friend—I can't remember, he is just blank . . . or even she, is just blank—was going to be attracted to this guy and not to myself. But for some rea-

son I wasn't as afraid as I ought to have been. I seemed to have some sort of metamorphosis. I became just like a strong-muscled Greek god. There was a lot of diving and once my bathing suit almost came off. It seemed like I was in a white bathing suit. Then it seemed like we were all waiting for a TV program that Miss X (a well-known Hollywood actress) was to be on just before the bell went off.

Dream 2. A and B (two prominent Hollywood entertainers) were lying on a bed in this room and I was apparently with them. The door suddenly opened and B—no, A—fired this gun, started firing his gun and the panels dropped out of the door and the whole door came crashing down. Then a half-visible man started walking in and said, "I am Mr. Blank; I want the plans." He walked over to A and put his hands around his neck and started to squeeze. It was odd because he was intangible, but it seemed as though A could feel him squeezing. We all started trying to squeeze him back and all of a sudden he became tangible or something, but anyway I started to hit him and I just knocked the hell out of him, the poor little fellow. And I remember standing there in a kind of a triumph just as the bell rang.

Dream 3. I dreamed I was coming into this room and I didn't have a key. I walked up to the building and Charles R was standing there. The thing was, I was trying to climb in the window. Anyway, Charles was standing there by the door and he gave me some sandwiches—I couldn't understand why he gave me the worst sandwiches. Anyway, we went on into the room and it didn't look like the right place at all. It seemed to be some kind of party. I think it was at that point when I started thinking about how fast I could get out of this place if I had to. And there was something about nitroglycerine I don't quite remember. The last thing was somebody started throwing a baseball.

Dream 4. I was talking to my aunt about how you got

in touch with the underground left over from World War II. . . . We went down to the dining room and I asked my mother about the underground and just as I was waiting for her to tell us what the World War II underground was, I said, "Don't you think we can settle the question?" and the bell went off.

Dream 5. Oh, this dream had something to do with a lecture. It was something about economics. But anyway I was sitting watching Professor Z and he was lecturing in a queer way. . . . All of a sudden this big argument broke out while he was talking and they were both going on at the same time—his lecture and the argument. Claude R and somebody else were arguing about the danger of inflation or something like that, and all of a sudden I realized I was awake.

In dream one and dream two of the night there is an identical plot line. The dreamer scores a physical triumph over a male adversary. In each case his victory follows a dramatic metamorphosis ("I became like a strong-muscled Greek god . . ." and "All of a sudden [Mr. Blank] became tangible . . ."). In the third dream of the night the dreamer is on the receiving end of his friend's hostility as he is given the "worst sandwiches." Also "something about nitroglycerine" figured in the action and "somebody started throwing a baseball" a few moments later. The bell sounded, however, before this apparent prelude to violence could develop. In the fourth dream the dreamer wants to get in touch with the underground left over from World War II. And in the fifth and last dream, a violent argument breaks out in Professor Z's lecture hall. The dreamer, quite literally, had violence on his mind.

None of these interpretations turned on knowledge of the dreamer's personal life. Yet, taken together, they provided valued insights not readily discernible in any individual dream.

THE THEME OF CONFLICT

The second approach to the interpretation of dreams in sequence—an analysis of the deeper meanings of the dream, using the more intensive associations of the therapeutic session—was undertaken by Offenkrantz and Rechtschaffen in 1959.

One of their subjects was a young professional man who had come to the University of Chicago clinics on his own, seeking personal therapy. In exchange for a reduction in his fee, the subject agreed to co-operate during his therapy with what was described to him as an experimental project concerned with dreams. The patient was seen by Offenkrantz for a total of eighty-three hours of therapeutic sessions over a period of eight months. During that time he also spent a total of fifteen nights in the dream-monitoring laboratory. Over fifty complete dreams were tape-recorded verbatim. Whenever possible during the therapeutic sessions that followed, his associations and comments on the dreams were also recorded.

For the first time the dreams of a person who was under strong personal pressures to reveal the innermost details of his life were recovered in unparalleled clarity by the new dream-monitoring techniques. A fascinating case book was gradually compiled; it ran to over one hundred pages—the deepest penetration into the inner dream world of an individual to date. Offenkrantz reported his first results from the prolonged experiment in May 1960 at the Forty-seventh annual meeting of the American Psychoanalytic Association in Atlantic City, New Jersey. As usual, Offenkrantz reported, the stuff of his subject's dreams were as varied as life itself. But the subject's associations to these dreams, coupled with

the knowledge of his personality gained by Offenkrantz during the therapy sessions, suggested underlying connections between many of the night's apparently unrelated dreams. Typically Offenkrantz found that all the dreams of a given night were focused on the same problem or on the same limited number of problems.

The actual dreams cannot be reproduced here, since a privileged doctor-patient relationship is involved. But the experimenters have written a case history sufficiently disguising the actual situation while at the same time conveying the key findings. That case history follows, with grateful acknowledgment to Dr. Offenkrantz for making it available:

The hypothetical patient is a junior executive in a large, conservative corporation. He is married, ambitious, and an ardent Democrat. In a psychotherapeutic interview on a particular day the patient reported that the only unusual new event in his life had been a violent argument with his boss. That night he was awakened at the end of each of five dreams and reported the following dreams. Associations were obtained later.

Dream 1: I heard that President Eisenhower was very sick, might even die. Associations: This dream reminded him of an unusually heated political argument the previous day with some of his commuter friends, older men and ardent Republicans, with whom he usually was on excellent terms.

Dream 2: I was living in my boss's home, and he was nowhere around. Associations: This dream recalled his hitherto secret plan to buy a home in the fancy suburb in which his boss lived. He had been doubtful about the boss's reaction.

Dream 3: I was in Miami Beach on vacation. Associations: This dream made him remember a thought he could not get out of his mind after the argument with the boss:

that for the first time in his life he felt he needed a winter vacation, which he knew was against company policy.

Dream 4: I was in jail. Associations: This dream stimulated the memory that he had passed a red light on the way home the previous evening. He had never done this before, and subsequently felt extremely guilty.

Dream 5: I was in bed, back at my childhood home. I was sick and my mother was nursing me. Associations: This dream reminded him that he had awakened with a severe cold that morning and had just about decided to take the day off from work. In fact the idea of staying in bed with his wife looking after him seemed rather appealing.

The interpretation of the underlying connections among these dreams assumes that the argument with the boss stirred up angry and competitive feelings which frightened him. He was not fully aware of any of this, even after the unusual run-in with the Republican commuters, who really represented the boss.

Thus in Dream 1 he retaliates by making someone ill who stands for the boss in his mind. In Dream 2 his competitive feelings are even bolder, and he displaces the boss right in his own home. In Dream 3 the rebellion continues with the unauthorized winter vacation, but a retreat to a safer place has also begun. In Dream 4 he is punished for the unacceptable feelings. In the final dream the retreat is complete and carries him back to a time in life when there were no bossy Republicans to stir up feelings which frightened him, and he was safe in his mother's care. This corresponds to the fantasy in real life of staying home from work with his wife caring for him.

The underlying theme connecting these apparently unrelated dreams is that they represent sequential "solutions" to the problem posed by his anger and competitiveness toward

his boss and the guilty fear which these feelings aroused. The structure of any particular dream seemed to depend, at least in part, on the consequences of the attempted solutions in previous dreams. For example, when the solution of a problem in one dream was relatively successful (Eisenhower's illness) the dreamer usually would attempt an even bolder gratification of a disturbing wish in the next dream (displacement of the boss). In turn, reactive motives such as fear of retaliation, fear of loss of love, guilt, or shame might be stimulated by the bolder gratification. Thus an alternation of gratifying and frightening dreams in the same night was not unusual. As the noted psychiatrist, Thomas French, once explained, ". . . every dream is struggling to find a solution for an unsolved problem in the present, left over from the preceding day. As in waking life, memories . . . [of solutions] from the past find their way into the dream thoughts, to serve as guides for the solution of similar problems in the present."

In December 1960, at the midwinter meeting of the American Psychoanalytic Association, Offenkrantz reported on a second series of monitorings. This time his subject was a married woman. Although no therapy was involved (Offenkrantz had offered to pay and the woman was interested in earning some money) the results with this "normal" subject supported the conflict idea noted in the first report. The conflict, however, is not always the same. It may vary from night to night, perhaps because there are many perplexities in life vying for or requiring attention. In the case of the subject in the second series, one night's theme of conflict might revolve around a desire to be free of housewifely duties; another night the theme might be hostility toward men. Success and failure, pleasure and pain, happy memories or sad recollections—all may also vary from dream to dream and from night to night.

As matters now stand the mechanism responsible for

this "scheduling" of dream activities is still unknown. Apparently the pattern of conflict and resolution is related to the other observed patterns. In the dreams of Mr. Brown, for example, there is the inappropriateness of the verb "wherrying" to the second dream of the night but its correct usage in the fourth dream of the same night. The Offenkrantz-French explanation might be that, at the moment of the dreamer's active mastery of the situation in the gratifying second dream, the latent image "barge," associated with fear of failure (the shipwreck in scene two of dream four), was already intruding to influence the dream.

DREAM DIARIES AND DREAM HOTELS

At present these and other questions cannot be answered. The science of dreams is less than ten years old. Almost certainly new and totally unexpected discoveries are going to be made in the future. Many more nights of monitoring will be needed in order to find the rules that can explain the present disorder of facts. Researchers like Dement, Arthur Shapiro at New York's Downstate Medical Center, and Frederick Snyder of the National Institutes of Health have come to the conclusion that dream monitoring must be automated to some extent in order to collect sufficient data. At present one operator of sufficient skill can watch two EEG machines, a limiting factor in the amount of dreaming that can be recorded. It is conceivable that an electronic computer can be instructed to read the slowly rolling drums and taught to recognize the distinctive brain-wave pattern of dreams, automatically sounding the buzzer when the pattern ceases. There is a prototype of such a machine now doing check-scanning, billings, and rudimentary reading tasks for banks and utilities companies in the United States.

When the dream scientists permit themselves a futuristic daydream, they can visualize a wardful or even a hotelful of subjects asleep while the Argus eyes of electronic computers detect their dreams and narratives are extracted automatically. Eventually smaller, portable EEG machines and tape-recording equipment could lead to do-it-yourself dream-monitoring kits; dream tapes might become as popular as diaries once were in a more leisurely age.

CHAPTER TEN

An End to Myth: Creative and Prophetic Dreams

The Dream of Kubla Khan · The Little People · The Experiment of the Frog's Heart · The Creative Act · A Puzzle for the Reader · Learning While Asleep · Prophetic Dreams · Diagnosis through Dreams · The Cult of Asclepius

In all the folklore of dreams and sleep that man has elaborated, two of his most cherished traditions have been that:

1. Brilliant discoveries and solutions come during dreams, when creative insight, sharpened by hard daytime work, can pierce to the heart of a problem.

2. Dreams foretell the dreamer's future, or foreshadow events-to-be; that is, "dreams come true."

With the development of the new science of dreams, lesser myths have been toppled. It is no longer possible, for example, to hold to the notion that dreamless sleep is best, that intelligent people dream more than dullards, or that nervous tensions, emotional passions, or midnight snacks make us dream. Most of the time-honored mythology of dreams has been demolished and the rubbish hauled away. The present-day status of the "creative-dream" tradition and of the "prophetic-dream" tradition, however, is not quite settled. As in the case of many traditions, they may have to be reinterpreted in the light of newly disclosed facts.

THE DREAM OF KUBLA KHAN

Of the two traditions, the creative dream is the most respectable and the most carefully chronicled. Historically the model of dream creativity is the nineteenth-century Romantic poet. Bolting upright in his four-poster bed, full of sudden inspiration, the Romantic poet would scribble a dream verse on his nightgown. The nightgown seemed an indispensable part of the creative act; according to that irreverent historian A. J. Liebling, the decline of lyric poetry can be shown to coincide with the exit of the male nightgown. Perhaps the most famous example of this nocturnal poetry was Samuel Taylor Coleridge's *Kubla Khan*, which was subtitled "A Vision in a Dream." In the summer of 1797 Coleridge, then twenty-five, had retired to a "lonely farm house" near the Somerset town of Porlock. In his *Literary Reminiscences* Coleridge gave this third-person account of how the poem *Kubla Khan* was written:

"In consequence of a slight indisposition, an anodyne [medicine] had been prescribed, from the effects of which he fell asleep in his chair at the moment that he was reading

the following sentence, or words of the same substance, in *Purchas's Pilgrimage:* 'Here the Khan Kubla commanded a palace to be built, and a stately garden thereunto. And thus ten miles of fertile ground were inclosed with a wall.' The author continued for about three hours in a profound sleep, at least of the external senses, during which time he had the most vivid confidence, that he could not have composed less than from two or three hundred lines; if that indeed can be called composition in which all the images rose up before him as things, with a parallel production of the correspondent expressions, without any sensation or consciousness of effort. On awaking he appeared to himself to have a distinct recollection of the whole, and taking his pen, ink and paper, instantly and eagerly wrote down the lines that are here preserved. At this moment he was unfortunately called out by a person on business from Porlock, and detained by him above an hour, and on his return to his room, found, to his no small surprise and mortification, that though he still retained some vague and dim recollection of the general purport of the vision, yet, with the exception of some eight or ten scattered lines and images, all the rest had passed away like the images on the surface of a stream into which a stone has been cast, but, alas! without the after restoration of the latter!"

More typically in this tradition, the writer's night insights were sharper and shorter—an incisive phrase, a sudden flash of imagination, a *coup de foudre.* William Makepeace Thackeray, for example, was agonizing over the title for a novel he had written about a rapacious girl named Becky Sharp. His inspiration, by his own first-person account, came to him while he slept: "I jumped out of bed, in the middle of the night, and ran three times around my room, uttering, as I went, *Vanity Fair, Vanity Fair, Vanity Fair.*"

THE LITTLE PEOPLE

Robert Louis Stevenson, on the other hand, claimed that most of his plots were provided in his dreams. Stevenson described himself as a "remarkable dreamer" and his account of the "dream factory" run by his Little People is worth quoting in detail. As a student at Edinburgh College, Stevenson wrote in his book *Across the Plains,* using the third person, he began "to lead a double life—one of the day, one of the night—one that he had every reason to believe was the true one, another that he had no means of proving to be false." Later, as an adult, Stevenson's "nights were for some while like other men's, now blank, now checkered with dreams—sometimes charming, sometimes appalling, but except for an occasional vividness, of no extraordinary kind." Then, about this time, the Little People made their appearance:

"This honest fellow had long been in the custom of setting himself to sleep with tales . . . but these were irresponsible inventions, told for the teller's pleasure, with no eye to the crass public or the thwart reviewer. . . . So that the little people who manage man's internal theatre had not as yet received a very rigorous training; and played upon their stage like children who should have slipped into the house and found it empty, rather than like drilled actors performing a set piece to a huge hall of faces. But presently my dreamer began to turn his former amusement of storytelling to (what is called) account; by which I mean that he began to write and sell his tales. Here he was, and here were the little people who did that part of his business, in quite new conditions. . . . When he lay down to prepare himself for sleep, he no longer sought amusement, but printable and

profitable tales; and after he had dozed off in his box seat, his little people continued their evolutions with the same mercantile signs. . . .

"When the bank begins to send letters and the butcher to linger at the back gate, he sets to belaboring his brain after a story, for that is his readiest money-winner; and, behold! at once the little people begin to bestir themselves in the same quest, and labor all night long, and all night long set before him truncheons of tales upon their lighted theatre. . . . Often enough the waking is a disappointment: he has been too deep asleep, as I explain the thing; drowsiness has gained his little people, they have gone stumbling and maundering through their parts; and the play, to the awakened mind, is seen to be a tissue of absurdities. And yet how often have the sleepless Brownies done him honest service, and given him, as he sat idly taking his pleasure in the boxes, better tales than he could fashion for himself. . . . The more I think of it, the more I am moved to press upon the world my question: Who are the Little People? . . .

". . . What shall I say they are but just my Brownies, God bless them! who do one-half my work for me while I am fast asleep, and in all human likelihood, do the rest for me as well, when I am wide awake and fondly suppose I do it myself. . . . For myself—what I call I, my conscious ego, the denizen of the pineal gland unless he has changed his residence since Descartes, the man with the conscience and the variable bank account, the man with the hat and the boots, and the privilege of voting and not carrying the candidate at the general elections—I am sometimes tempted to suppose he is no storyteller at all, but a creature as matter of fact as any cheesemonger . . . and a realist bemired up to the ears in actuality; . . . I can give but an instance or so of what part is done sleeping and what part awake, and leave the reader to share what laurels there are, at his own nod,

between myself and my collaborators; and to do this I will first take a book that a number of persons have been polite enough to read, *The Strange Case of Dr. Jekyll and Mr. Hyde*. I had long been trying to write a story on this subject, to find a body, a vehicle, for that strong sense of man's double being which must at times come in upon and overwhelm the mind of every thinking creature. I had even written one, *The Travelling Companion*, which was returned by an editor on the plea that it was a work of genius and indecent, and which I burned the other day on the ground that it was not a work of genius, and that *Jekyll* had supplanted it. Then came one of those financial fluctuations which (with an elegant modesty) I have hitherto referred to in the third person. For two days I went about racking my brains for a plot of any sort; and on the second night I dreamed the scene at the window, and a scene afterwards split in two, in which Hyde, pursued for some crime, took the powder and underwent the change in the presence of his pursuers. All the rest was made awake, and consciously, although I think I can trace in much of it the manner of my Brownies."

THE EXPERIMENT OF THE FROG'S HEART

Though the tradition of dream creativeness was originally rooted in poetry and literature, it has also flourished in music, art, and, most recently, in science.[1]

[1] There is at least one documented example of dream creativity from the world of sport. Apparently, Floyd Patterson of Rockville Center, New York, the heavyweight boxing champion of the world, is an ardent dreamer. Patterson, according to a report by A. J. Liebling in *The New Yorker* magazine, dreamed of a new punch that his opponent, Ingemar Johansson, could not block; waking, he leaped from his bed and ran to a mirror to try it out "like a poet carrying a couplet to the escritoire."

After the fight, however, Patterson told Liebling that the inspirational

There is the dream, for example, that won the 1936 Nobel Prize in Physiology and Medicine for Dr. Otto Loewi, the German-born physiologist who has lived since 1940 in New York City. Dr. Loewi described the incident in the Autumn 1960 issue of *Perspectives in Biology and Medicine*, in an article entitled "An Autobiographic Sketch."

". . . the best known of my scientific achievements is the establishment in 1921 of the chemical theory of the transmission of the nervous impulse. Until 1921 it was generally assumed that transmission was due to the direct spreading of the electrical wave accompanying the propagated nervous impulse from the nerve terminal to the effector organ. Since the character of that potential is everywhere the same, such an assumption would not explain the well-known fact that the stimulation of certain nerves increases the function of one organ and decreases the function of another. A different mode of transmission had, therefore, to be considered.

"As far back as 1903, I discussed with Walter M. Fletcher from Cambridge, England, then an associate in Marburg, the fact that certain drugs mimic the augmentary as well as the inhibitory effects of the stimulation of sympathetic and/or parasympathetic nerves on their effector organs. During this discussion, the idea occurred to me that the terminals of those nerves might contain chemicals, that stimulation might liberate them from the nerve terminals, and that these chemicals might in turn transmit the nervous impulse to their respective effector organs. At that time I did not see a way to prove the correctness of this hunch, and it entirely slipped my conscious memory until it emerged again in 1920. The night

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punch proved to be useless. Then, two nights before another fight with Johansson in March 1961, Patterson had another dream. In it Johansson knocked him out with a right hand and won the championship. The dream turned out to be false. Patterson's opinion of dreams has become less favorable: "A dream," he told Liebling, "is just an empty space waiting for somewhere to fill in."

before Easter Sunday of that year I awoke, turned on the light, and jotted down a few notes on a tiny slip of thin paper. Then I fell asleep again. It occurred to me at six o'clock in the morning that during the night I had written down something most important, but I was unable to decipher the scrawl. The next night, at three o'clock, the idea returned. It was the design of an experiment to determine whether or not the hypothesis of chemical transmission that I had uttered seventeen years ago was correct. I got up immediately, went to the laboratory, and performed a simple experiment on a frog's heart according to the nocturnal design . . . its results became the foundation of the theory of chemical transmission of the nervous impulse."[2]

THE CREATIVE ACT

Each of the above episodes is involved in some way with the act of creativity, a perplexing process awake or asleep. Unfortunately none of these accounts is in precise or objective language; even Loewi could only describe the moment

[2] Two earlier examples of scientific dream activity are reported in Woods' *The World of Dreams*. One is the dream of Friedrich A. Kekulé, professor of organic chemistry at Ghent University, one night in 1865. Chemists, Kekulé included, had long puzzled over the particular arrangement of atoms within a molecule of benzene. Kekulé dreamed of a snake with its tail in its mouth—an image he interpreted (when awakened) to signify the closed carbon ring of the benzene molecule. A similar experience involved Dr. Hermann V. Hilprecht, a professor of Assyriology at the University of Pennsylvania. One Saturday evening in March, 1893, Hilprecht was reading proof on some pages of a book he had written about certain Cassite period (ca. 1700–1146 B.C.) fragments. The classification of two fragments still eluded him; after midnight "weary and exhausted," he fell asleep and dreamed—he does not say at what time during the night—that a "tall, thin priest of Nippur" approached him and explained that two fragments published separately on pages 22 and 26 of his book belonged together.

Hilprecht awoke and aroused his wife to tell her in case he should forget himself. The next morning, he said, he verified the fragments "in the light of these [dream] disclosures."

of night insight vaguely: "The next night, at three o'clock, the idea returned . . ." Nevertheless we know more about the creative act now than did those critics of an earlier day, who speculated that the tubercular Robert Louis Stevenson's "frail health and frequent fevers . . . heightened and enriched" his dream life. The new knowledge of the dream cycle provides a different perspective. Stevenson's feverish nights of sleep may mean only that he was more likely to toss fitfully awake after many of his nightly dream episodes. Coleridge began taking opium while he was a student at Cambridge, and *Kubla Khan* has in the past been considered a drug-induced vision. On the other hand the dream came, according to Coleridge, after he had been asleep about three hours—or approximately about the time the second dream of the nightly cycle typically occurs. Loewi dreamed of the frog's-heart experiment on two successive nights. This would seem to reflect the new "lateral homology" findings —the particular dream at a particular time—made by Drs. Offenkrantz and Rechtschaffen.

Further, modern psychiatry has informed us about the mind's vast treasure house of "lost" memories, which, we know now, are never really lost. Dr. Loewi himself, as a physiologist with strong theoretical interests in psychiatry, kept trying to understand why the experimental design "emerged" at night, and seventeen years after the original hunch. It turned out that in 1918, two years before the Easter Sunday dream, he had performed a similar experiment as part of a test of a quite different idea he was then attempting to verify. This 1918 experiment, Loewi says, was an "essential preparation" for the finished design. In fact the "nocturnal concept represented a sudden association" of the old hypothesis of 1903 with the new method tested in 1918. "Most so-called 'intuitive' discoveries," Dr. Loewi offers, "are such associations made in the unconscious."

The creative process, of course, is not totally opaque. One obvious phase of creativity, artistic or scientific, is careful preparation; not everyone can compose a *Kubla Khan* or conceive of a frog's-heart experiment in his dreams. Archimedes' inspiration came to him in a bathtub, Newton's in an apple orchard, and Darwin's while he was reading Malthus. But, as the bacteriologist Professor Hans Zinsser has pointed out in his autobiography, they are not "messages out of the blue." Rather "they were the final co-ordinations, by minds of genius, of innumerable accumulated facts and impressions which lesser men could grasp only in their uncorrelated isolation, but which—by them—were seen in entirety and integrated into general principles."

The sequence of this scientific co-ordination has been set down recently by a first-rate research chemist and teacher, Professor James Bonner of the California Institute of Technology. In an article in the March 1959, issue of *Engineering and Science* Bonner listed these five steps to scientific creativity:

1. Define the question. This may in itself be a creative act, since to recognize a question which has not been asked before may take great creativity.

2. Stuff with facts. Once the question has been defined, the potential scientific creator must have all the information he can get. He may have to do some experiments; he reads the literature; he gets together all the information that he can imagine bears upon the question at issue.

3. Wait. The scientist may mull the facts over; he may worry; but in principle what he has to do now is wait.

4. A solution pops out. Perhaps many solutions pop out. Often solutions emerge to consciousness when one is half asleep, or perhaps during a daydream.

5. Assess the solution. The scientist must now ask himself whether his new creative idea is a useful one or not: Is it

good or bad? Does it actually unify everything that is present to be unified?

Steps one, two, and five, Bonner writes, are conscious and logical. But steps three and four take place in the preconscious. These steps are related to the second, and less understood, aspect of the creative act: spontaneity, or the idiosyncratic opportunity for the new solution to "pop out" from the preconscious. Creativity and spontaneity, according to Bonner, are closely allied, perhaps identical; when the "nay-saying" faculty is eased, as in half-sleep, the creative solution is more likely to emerge. Loewi's Nobel prize-winning hunch is a good example of this dream spontaneity. "If carefully considered in the daytime," Loewi says, "I would have undoubtedly rejected the kind of experiment I performed [as] improbable." To future experimental scientists, he offers this bit of advice: "We should sometimes trust a sudden intuition without too much skepticism." Or, as Tennyson wrote, "Maybe wildest dreams are but the needful preludes of the truth."

Stevenson's famous *The Strange Case of Dr. Jekyll and Mr. Hyde*, a dream insight, was actually prelude to an important truth. In this familiar tale the satanic and loathsome Hyde emerges from the good and respected Jekyll. This profound insight into man's dual nature, Dr. Charles D. Aring has pointed out in an essay in the Winter 1960–61 issue of *The American Scholar*, was achieved by Stevenson in advance of the great psychologists and sanitarians of the mind, Freud and Jung included.

A third aspect of the creative act is the creative mind itself. An experimental scientist who follows Professor Bonner's five-step sequence is not therefore automatically assured of a major discovery. Literary biography is full of examples of brilliant writers who have had to struggle along without the help of Stevensonian "Little People." Aldous Huxley,

for example, has written ten novels and a score of books of essay, history, drama, poetry, biography, and travel. Yet he can only envy Stevenson and his helpmates. "I've never had any Brownies," Mr. Huxley recently told an interviewer from *The Paris Review*. "The great difficulty for me has always been creating situations. I have a great difficulty in inventing plots. Some people are born with an amazing gift for storytelling; it's a gift which I've never had at all." Stevenson described how he saw plots and scenes whole in his dreams. Huxley, on the other hand, says he works a chapter at a time, finding his way as he goes, knowing "very dimly when I start what's going to happen."

Here, then, are two contrasting modes of literary creation by men of undenied, but differing, genius. Stevenson, as Dr. Aring has observed, had the peculiar ability to harvest his genius by day and by night. Perhaps no one has marketed his dreams on so large a scale. Meanwhile, according to Aring, who is the chairman of the department of neurology at the University of Cincinnati College of Medicine, the rest of us are proceeding along in our usual improvident ways—dreaming four or five times a night and bringing back only a meager harvest at best. "We ordinary people have found no comparable uses for these streamy meanderings that visit us mainly in the night," he observes; "perhaps there are none."

Perhaps. Yet, there seem to be some prospects that creative insights during dreams are not beyond the ordinary intellect. These prospects are mainly inferred from the dream-monitoring experiments. There is, for example, the extraordinary dream detail and Proustian memory which is revealed in the transcripts recorded in the laboratory (Chapter Nine). There are also the many signs of dream "control." No dream laboratory, at least up to the time that this is written, has recorded a real nightmare dream or a "wet dream." Since

nightmares and wet dreams are not uncommon events, the presumption of the dream investigators is that dreams can be held in check in some "conscious" manner. This paradoxical consciousness while sleeping might be the sleeper's "awareness of the experimental situation." Or, as one investigator put it more starkly, "The sleeper realizes that someone is tapping into his mind."

Another example of this consciousness was recorded in the Chicago sleep laboratory in the course of an extended study of two male college volunteers in their early twenties. After several nights of monitoring, one of the volunteers—making some educated guesses—became quite familiar with the dream cycle. In his twelfth experimental night he was awakened after his usual quota and reported a series of five dreams. In the first dream he was *alone;* in the second dream there were *two people;* in the third dream he rode a bicycle and carried a *third wheel* on his back; in the fourth dream he found an egg with *four yolks* in it; and in the fifth dream he dreamed that blue jeans must be washed *five times* in order to make them properly (*i.e.*, collegiately) sloppy and faded.

A PUZZLE FOR THE READER

More direct evidence of every-night wisdom is being collected now by Dr. William Dement. He is giving a problem in logic to groups of adults in order to put the creative-dream tradition to a controlled test. Before giving them the problem, he passes out the following hectographed instructions, which he has kindly permitted to be reproduced here:

"After you have read these directions you will find a problem to solve. It may seem a bit difficult, but its solution definitely requires *no* special training beyond that which this group might be expected to possess. The solution is simple

and will be recognized as correct when it is arrived at. However, because of the nature of the problem, it is no reflection on your intellectual capabilities if you cannot solve it.

"This is important! Do not attempt or even think about the problem until you are ready to go to bed. Obviously it would invalidate the experiment if you obtained help. When you are ready to go to bed, devote *15 minutes*, no more, to a vigorous attempt to solve the problem. If you should solve it at this point, note the amount of time it took, and go to bed. If you have not solved it after 15 minutes, put it out of your mind and go to bed.

"Whether or not you reached a solution, if you have any dreams during the night, please try to remember them and write them down, especially if they have anything to do with the problem. It sometimes helps to remember dreams if you keep a pad of paper and pencil handy to write them down as soon as you awaken.

"It is possible that the solution to the problem will come to you in a dream or sometime during the night. If not, as soon as you arise, devote an additional 15 minutes, no more, to the problem. If you are on a split-second schedule perhaps you can set your alarm 15 minutes earlier in order to do this. Naturally, if you solved the problem on the previous evening you have nothing to do in the morning. However, you must still attempt to record your dreams.

"This is important! The time spent in a willful, conscious attempt to solve the problem should total no more than *30 minutes*."

The problem itself is of the brain-twister type—seemingly difficult but with a simple solution—the kind intelligent adults may miss and an ingenious child solve. It is given below, *without* the answer—should any reader wish to test his own problem-solving abilities during dreams some night and con-

vey the results to Dr. Dement in care of the writer. The problem:

The letters "O, T, T, F, F, –, –," form the beginning of an intelligible series. The problem is to add two more letters in the series. It is obvious that once the problem is solved, an infinite number of letters can be added.

Again, without giving the answer and spoiling the test for any who may wish to take it, it can be said that about 80 per cent of those who reported dreams at all dreamed of the problem; some stumbled across the answer in their dreams but didn't recognize it. Several others have dreamed of correct solutions. "That makes the point," Dement says, though he has no plans to put creative dreams to work as yet.

LEARNING WHILE ASLEEP

But, inevitably, in our Western, work-oriented society, restless minds have sought to put the "wasted" hours of sleep to productive use. Their goals are practical: language teaching, moral uplift, and indoctrination of facts. In a word, "sleep learning," rather than the literary creations of a Stevenson or the scientific insights of a Loewi. The hidden, inner splendors and deep streamy associations of the dream world are left untapped; instead, a tape recorder prosaically plays the lesson of the night into a small speaker tucked under the sleeper's pillow. His pillowed head, of course, makes a tempting target.

Sleep learning as an educational technique, according to Dr. Charles V. Simons, a respected psychologist to whom I am indebted for permission to quote from his definitive studies carried out in the 1950s, was apparently first proposed by the science fiction writers. In 1911, Hugo Gernsback wrote a story for a magazine named *Modern Electrics;* in the

story the hero learned from a machine that played while he slept. Then, in Aldous Huxley's *Brave New World* (1932), the technique of *hypnopaedia* was introduced. In that memorable scene at the State Conditioning Center, while eighty little Beta boys and girls napped in a shuttered dormitory, a loud-speaker under each pillow insinuatingly whispered the afternoon lesson in elementary class consciousness: ". . . I'm really awfully glad I'm a Beta . . . we are much better than the Gammas and the Deltas . . . oh, no, I don't want to play with the Delta children . . ." Thus, the World State of the future conditioned the behavior of its subjects through endlessly repeated suggestions, night after night, during the hours of drowsiness and sleep.

Huxley's chilling forecast placed *hypnopaedia* some 600 years hence. Just a decade later nature imitated art, although on a much more modest scale. In the early 1940s the psychologist L. Le Shan, attempted to break the fingernail-biting habit of twenty boys, ages eight to fourteen, at a summer camp. Le Shan played the recorded phrase "*My fingernails taste terribly bitter*" through a loud-speaker 300 times a night for fifty-four nights—the entire camping season. For control purposes, another cabin full of nail-biting boys received no nocturnal suggestions about the bitterness of biting. The nails of both groups were inspected every two weeks; eight of the twenty nail biters in the suggestion group stopped biting. None of the control group did. Le Shan concluded that there were indications of "the possible therapeutic use of suggestion during sleep."

Recently the first governmental body tried its hand at *hypnopaedia*. The agency, considerably less formidable than Huxley's World State, was the Woodland Road Camp, a penal institution in Tulare County, California. Its message, played every hour throughout the night to volunteers among the prisoners, was benign:

"Sleep, sleep, you are now completely asleep. Listen my inner self. Remember and obey this creed of life. Live. Relax. Completely and utterly relax. Heal my soul. Unite subconscious with my conscious life. . . . Love rule my life. Love God, family, others. Do to others as I want them to do to me . . ."

John Locke, the lawyer who initiated this program in the autumn of 1957, has been quoted as saying that many alcoholics among his prisoner-hypnopaediants "have quit drinking." But psychologists who have attempted to transmit facts to sleeping students report little or no success. In 1952 B. H. Fox and J. S. Robbins, for example, played Chinese-English vocabulary records to three groups of sleeping college students. The correct list was played to one group, an incorrect list to a second, and music was played for a third, control, group. Anyone awakening during the night was disqualified; in the morning each group was given a vocabulary test. Fox and Robbins said the first group did better and concluded that learning could occur during sleep. However, W. G. Hoyt of George Washington University, reporting on a similarly designed experiment in 1953, concluded that learning during sleep could not be detected.

Simons and his colleague, William H. Emmons, were skeptical of these experiments, in part because they were conducted without regard for the various *levels* of sleep, as reflected on the EEG machine. In 1954–55 they designed an experiment to test learning in relation to drowsy or transitional sleep, light sleep, and deep sleep. For training materials Simons and Emmons selected ninety-six "general-information" questions and answers. A sample question and answer: "In what kind of store did Ulysses S. Grant work before the war?" "Before the war, Ulysses S. Grant worked in a hardware store." The questions and answers were put on tape and each played at five-minute intervals throughout the night.

Simultaneously a pen marked the slowly turning EEG drum when each question and answer was presented. Various precautions were taken to insure that the sleepers were indeed asleep, and a control group was used.

Simons and Emmons found that the sleep learning group did no better than the control group when the distinctive EEG deep-sleep spindles were recorded. The sleep learners, however, fared better with those questions and answers which were presented to them during the falling-asleep state. The authors concluded in their report in the *Journal of Experimental Psychology* for February 1956: "It may be possible that in the drowsy state preceding sleep the individual is more susceptible to suggestion."

Unfortunately the Simons-Emmons experiment was conducted before all the new dream findings had been made public; otherwise they might have looked more closely into learning scores during dream sleep. When the Chicago dream researchers attempted to present learning materials during dream sleep, they had difficulty keeping the sound at the correct intensity and some sleepers were awakened.

More recently, in May 1961, Allen M. Granda and John T. Hammack, two investigators at the Walter Reed Army Institute of Research in Washington, described in the journal *Science* how they were able to train five volunteers to perform a simple mechanical task while asleep. Their procedure went like this: At bedtime the five young GIs lay down on a cot with a switch lever taped to each hand and two shock electrodes attached to the right leg. Above each cot was a flashing light. The men were instructed to press the right-hand lever whenever the light flashed in order to avoid an electric shock to the leg. They were also told that the flashing light could be turned off completely (thus permitting them to sleep) as long as they maintained a certain lever-switching "work" output with their left hand.

Granda and Hammack discovered that the men continued

to operate the switches even when physiological indicators, such as the brain-wave patterns, showed them to be in the deepest stages of sleep. The psychologists concluded that "higher mental states" are present during sleep.[3] This finding suggests that simple tasks of physical co-ordination, if not complex intellectual activities, could be carried out during sleep. Future space men, for example, might be able to activate certain control levers and communications switches aboard a Mars-bound spaceship while getting needed rest.

None of the more sobering findings, of course, have tempered the sometimes extravagant claims made by the sellers of sleep-training machines and records. Sleep learning, while not big business, has become good business for such firms as Moderno Phone, Inc., which markets a Dormophone record player for $149.50. These table-top-size record players are equipped with pillow speakers and clock-timers which automatically turn records on and off while the student sleeps. The prices of the records range from $7.50 for the Reverend Norman Vincent Peale talking on "The Power of Positive Thinking" to $165 for a "Personality-development Course." The Breckenridge Institute, established in 1957 as a division of the Abundavita Corporation of America (a food-supplement manufacturer) offers a "package"—phonograph, speaker, and a twenty-five-lesson self-help course for $395. Among the topics covered are: "Creative Imagination," "Faith and Self-Confidence," "Money—What It Is and How to Have Plenty of It," and "Making Success Automatic."

One sleep-learning firm officially estimated for the August 1959 issue of the management magazine *News Front* that the "industry" expects a sales volume of fifty million dollars within five years. "We're going to get a big slice of the tranquilizer business," he was quoted as saying.

[3] This idea is developed more fully in the final chapter.

PROPHETIC DREAMS

The notion that dreams foretell the future is one of the oldest beliefs of mankind. Among the ancients, of course, there were many means considered appropriate for divining the future: aleuromancy, geomancy, hydromancy, pyromancy, selenomancy, which are, respectively, divination by means of flour, earth configurations, images seen in water, images seen in fire, and by phases of the moon, as well as eating parts of animals, casting horoscopes, and the varied divination arts of augurs, zodiac sorcerers, magi, astrologers, and genethlialogists. But dreams had a special status among omen readers. The ancients—Egyptians, Assyrians, Jews, Greeks—believed that dreams were sent by the deities as unfailing indications of the dreamer's future. Dream books, we saw in Chapter One, attempted to discern this future in the events of the dream.

The best-known ancient prophetic dreams are in the Bible. The Hebrews were good dreamers. The Old Testament recounts the dream of Abimelech, in which God visited him "in a dream by night" and told him Abraham was a prophet (Gen. 20:3–7). Joseph's dream of the sheaves in the field is told in Gen. 37:5–7; Laban the Syrian is visited by God in a dream and warned "Take heed that thou speak not to Jacob, either good or bad," in Gen. 31:34. And in Gen. 31:11 Jacob told how "an angel of God spake unto me in a dream, saying, Jacob: And I said, Here am I." In the Book of Daniel, God frequently speaks to His people in dreams. In Numbers 12:6 the Lord says, "If there be a prophet among you, I the Lord will make myself known unto him in a vision and will speak unto him in a dream." The New Testament also has its share of prophetic dreams.

They play, for example, a key role in Saint Matthew's account of Jesus' birth. Joseph is told in a dream that his wife is pregnant (1:20). Later the Child's life is saved twice, thanks to "visions of the night" (Matt. 2:12–13).

The late Professor Alfred Guillaume, the biblical scholar, observed in his *Prophecy and Divination* that the New Testament is most strikingly Hebrew and shows the closest affinity with its Semitic environment when dreams are of paramount importance and affect the course of events, as in Saint Matthew. The Old Testament, in turn, is most strikingly visionary and shows the closest affinity to its Mesopotamian environment in Genesis. As Guillaume points out, the land of Canaan that the biblical Hebrews entered was home to the savage devotees of Baal—cults that sought visions through ecstatic rites, self-mutilations, frenetic dances (*e.g.*, the whirling dervishes), human sacrifice, and sacred prostitution.

Geography may be one reason for this preoccupation. The vast and level expanses of the Near Eastern deserts, as the Egyptologist Dr. James Henry Breasted noted, seemed particularly suited to visionary experiences and heightened attention to inner concerns. Sir Edward Tylor, the British ethnologist, makes a similar point. In his *Primitive Culture*, he anticipated a modern "sensory-deprivation" theory of religious dreams. "From the earliest phase of culture upwards," Sir Edward wrote, "we find religion in close alliance with ecstatic physical conditions. These are brought on by various means of interference with the healthy action of body and mind. . . . Among the strongest means of disturbing the functions of the mind so as to produce ecstatic vision is fasting, accompanied as it so usually is with other privations, and with prolonged solitary contemplation in the desert or forest." A more theistic view of the same phenomenal interest was offered by Guillaume. A person

whose whole being is concentrated in knowing and doing God's will, he suggested, might very well receive a divine message in his dreams.

Today religious visions are no longer venerated and encouraged as they were among the ancients and in the early Middle Ages. On the contrary, the churches of the Inquisition and after burned visionaries as witches or heretics. Since the age of psychological enlightenment, in the words of Dr. Ian Stevenson, chairman of the department of psychiatry at the University of Virginia School of Medicine, people who have visions of seeing God or the future are thought to be not wicked, but sick. This attitude, Stevenson notes wryly, has led to more humane treatment but not necessarily to greater understanding of these experiences. In the late nineteenth century, however, clairvoyance and other related "parapsychological powers" came under scientific scrutiny, first in England and later in the United States. Two groups, the Society for Psychical Research in London (founded in 1882) and the American Society for Psychical Research (founded in 1884) in New York, gather cases of alleged clairvoyance, extrasensory perception, telepathy, hyperkinesis (all known collectively as *Psi* Phenomena), analyze and publish them. One of the most famous cases of clairvoyance—although, of course, predating the society—is the dream that Abraham Lincoln allegedly reported to his friend Ward Hill Lamon a few days before he was assassinated. In the dream Lincoln saw a soldier standing guard over a corpse in the East Room of the White House, asked who was dead, and was told, "The President; he was killed by an assassin."

Such premonitions of death and previsions of disaster are fairly common themes in Society collections. Dr. Gardner Murphy, Director of Research of the Menninger Foundation and a past president of the American Psychological As-

sociation, has cited some of these cases in *Challenges of Psychical Research—A Primer of Parapsychology;* the following is a portion of a dream reported by a Louisiana woman in 1957:

". . . during the night I dreamed that I walked into Billy's room and picked him up from his bed and sat down in a rocking chair. I kissed his forehead and he was burning with fever. He seemed to be very limp and he did not know me. While I was sitting there rocking Billy I was crying because he seemed almost dead. My son, John, came to the door of Billy's room. . . . I asked him what was wrong and he said he fell from a telephone pole. . . . The dream I had was re-enacted completely. I went . . . into Billy's room and picked him up. I kissed his forehead and he was burning with fever and did not know me . . . in the meantime John had fallen from a pole while he was at work and had been brought home. . . . Almost every dream I have comes true either directly or indirectly. Almost always they are of an ordinary nature, not signs of disaster like this one. I have dreamed of relatives whom I haven't seen for years only to hear from them the next day. Maybe I get a wedding invitation from one, or maybe I have unexpected company. Every night I go to bed I hope I will not have a dream!"[4]

Dr. Murphy is a sincere and intelligent scientist. It seems best, at least for a science reporter, to have an open mind in all matters of research. The heresy of yesterday sometimes becomes today's orthodoxy. The recurrent and healthy anxiety of the reporter is that he will be marked down in history as the man who scoffed at genius. Nevertheless there seem to be easier ways to explain "dreams come true." Neither Lincoln's premonitory dream nor his assassination should be surprising. Lincoln was aware from his mail that

[4] *Challenges of Psychical Research—A Primer of Parapsychology*, by Gardner Murphy, M.D. New York: Harper & Bros., 1961.

there were bitter-enders and firebrands who would like to kill him; many plots against his life had come to his attention. He was certainly conscious of the fact that his life was in danger.

So, too, with the dreams of a loved one's death or injury. At any given time in any given day some mothers must necessarily dream of their sons' deaths; some of these sons must necessarily die. On the basis of mathematical chance alone—the number of dreams, the number of dreamers—some dreams must "come true" sometime.

This statistical effect was demonstrated three decades ago in one of the few published attempts to check so-called "clairvoyant dreams." In March 1932, a few days after the baby son of Colonel Charles A. Lindbergh was kidnaped, two young members of the Harvard Psychological Clinic, Henry A. Murray (now professor of psychology) and D. R. Wheeler, published a newspaper request for dreams about the kidnaping. The story of the kidnaping, involving as it did the nation's number-one hero, was given sensational treatment in the newspapers. Some 1300 persons all over the United States and Canada responded to the Harvard request and sent in their dreams before the baby's naked body was found in a ditch. Seven of the 1300 dreams involved a combination of the three critical elements (dead, naked, ditch), not enough statistical evidence to support the contention that distant events and dreams are casually related.

No society, of course, had been formed to collect the literally millions of dreams dreamed every night that don't "come true." Voltaire put the issue succinctly and deserves the last word here:

"Dreams which have come to pass are always predictions which no one can doubt, no account being taken of dreams which are never fulfilled. One dream accomplished has more effect than 100 which fail."

DIAGNOSIS THROUGH DREAMS

A special class of dreams in the prophetic-dream tradition requires separate attention. These are the dreams which turn inward and seem to predict the onset of physical and mental illness. There are several citations of such "diagnostic dreams" by patients in recent medical literature. In these cases there were no clear-cut signs of the maladies when the physicians conducted their original examinations. Professor Medard Boss of the University of Zurich reported he had collected "many hundreds" of such dreams and recounted some vivid examples in his book *The Analysis of Dreams*.[5] One woman patient, for example, rang up her doctor on two successive nights after the same frightening dream. In each dream a "Balinese demon of disease appeared and forced her to sit on an overheated central-heating pipe. She experienced an unsupportable burning pain between her legs . . . which . . . woke her. . . ." On the third night she was awakened again by the same dream; her doctor finally examined her and gave her a urinalysis; she proved to have an acute cystitis, an inflammation of the bladder.

Such case histories, of course, can be explained away on the basis of mathematical chance, as was Lincoln's dream or the mother's dreams. On the other hand an argument for the diagnostic dream can be made without recourse to *Psi* Phenomena or other will-o'-the-wisp explanations.

One dream investigator—non-*Psi*, even anti-*Psi*—has offered three possibilities to account for diagnostic dreams. Though he does not as yet wish to be identified in public, his explanations do make the phenomenon seem plausible:

[5] *The Analysis of Dreams*, by Medard Boss, M.D., translated by Arnold J. Pomerans. New York: Philosophical Library, Inc., 1958.

1. The shutting out of external stimuli during sleep could cause the dreaming mind to be much more attentive to stimulation from within. When we don't have to attend to the bustle of external events, we may become aware of faint aches and pains which had previously gone unnoticed.

2. With the rest and general diminution of body activity that usually come with sleep, there is a decrease in the amount of internal, as well as external, stimulation. Figuratively speaking, this could serve to cut out a lot of "background noise" and make pathological sensations stand out in bolder relief.

3. It could be that fear of an impending illness causes us to repress our awareness of it while awake. During sleep, when our repressive defenses are presumably more relaxed, the awareness of illness may become manifest in dreams.

He has proposed an objective test of the notion that dreams might signal the approach of disease. One procedure might work this way: From among the men and women who come to the clinic for checkups and routine studies, the dream investigators would select subjects for a few nights of dream monitoring in the now-established manner. Specialists and psychiatrists would examine the tape-recorded dreams and make a prediction as to the patient's outlook. Later a "clinical examination of those cases in which there was apparently successful prediction from the dreams would be expected to shed light on the mechanisms underlying the special sensitivity of the dream."

Three near-incredible examples of what might be expected from the possible heightened "attentiveness" of sleep have been recorded by Dr. Jay T. Shurley, a colleague of Dr. Louis Jolyon West at the University of Oklahoma and chief of the psychiatric service of the Veterans' Administration Hospital in Oklahoma City. Dr. Shurley used the water-tank apparatus described on page 175 to create a situation of

almost total sensory deprivation. His first report on the experiments was given at the annual meeting of the American Psychiatric Association in Atlantic City, New Jersey, in May 1960. Among his twelve subjects were three physicians who remained in the tank up to six hours, floating in the tepid water with latex masks covering their faces. One physician reported how startled he was to hear his own heart sounds with "ear-filling intensity." Another said he heard "the repeated snapping sound" of his own aortic cusps closing at the end of each systole, or contraction, of the heart. A third reported in awe that for the first and only time in his life he heard "the gliding sound" made by the moving of his large joints.

THE CULT OF ASCLEPIUS

A stele, or stone tablet, excavated from a fourth-century B.C. temple near Epidaurus on the east coast of Greece carries this inscription:

Nicasibule of Messene for [the sake of] offspring slept in the temple and saw a dream. It seemed to her that the God approached her with a snake which was creeping behind him; and with that snake she had intercourse. Within a year she had two sons.

This is Case Number 42, one of the many "cures through dreaming" attributed to Asclepius, the divine physician of ancient Greece. The steles show that patients approached the physician-god's sanctuary at Epidaurus with a variety of ills—barrenness, blindness, deafness, headaches, battle wounds, and paralysis, among others. Invariably, so the testimonies alleged, the supplicant sick were cured in a most extraordinary way: like Nicasibule, they slept within the

sacred enclosure of the temple and the god Asclepius appeared in their dreams to treat their disabilities.

These dreams went far beyond the diagnostic dreams reported by Dr. Medard Boss. They offered treatment and health without delay: the blind see the next morning; the lame walk away sound; growths disappear overnight. In one case a partially paralyzed man dreamed he was playing dice somewhere below the temple. As he was about to cast the dice, "the god appeared, sprang upon his hand, and stretched out his fingers." Another man approached "with a stone in his membrum. He saw a dream. It seemed to him he was lying with a fair boy and when he had a seminal discharge, he ejected the stone. . . ." A woman named Andromache wanted a child; in her dream "a handsome boy uncovered her, after that the god touched her with his hand." She later gave birth, according to the stele. A lame man entered the sanctuary on a stretcher. He dreamed the god broke his crutch, ordered him to climb a ladder, and chided him for cowardice when he got only part way up. At daybreak the man climbed the ladder.

Most modern scholars have been skeptical of these claims. They saw themselves faced with two alternatives: (1) that the cures were genuine intercessions of divine power in human affairs, or (2) that the stele were out-and-out fictions made up by clever priests in order to attract people—and revenue—to the temple. Professor Charles Singer, in his authoritative *Short History of Medicine*, states this latter view with asperity. Asclepius, he writes, represents the "dark way of the magician . . . although we inherit the scientific spirit from the Greeks, they are also in part responsible for some of the basest forms of medical jugglery that have afflicted and still afflict man. . . . The temple jugglery is ancestor, both by imitation and direct tradition, of much medieval and modern medical miracle-mongering."

Somewhat more charitably, others have held that the testimonies were typical miracle stories, such as are to be found in all religions. The real cures, it was claimed, consisted in shrewd dream interpretation by priests who were trained in medicine.[6]

A third view has been offered by Emma J. and Ludwig Edelstein in their exhaustive and scholarly two-volume study of the Asclepian cult, published in 1945 by the Institute of the History of Medicine at the Johns Hopkins University. The cult of the dream, they argue, was too extensive to be fraudulent. From Greece, Asclepius' sites spread eastward and westward during the Hellenistic period until they blanketed the ancient world. Estimates of the number of temple sites vary from 186 to 410. Every city had its Asclepieia. In Athens the temple (circa 300 B.C.) occupied a position of honor on the south slope of the Acropolis; the Roman site was on low-lying Tiber Island. "The ancients were hardly so easy to fool," note the Edelsteins, "that a mummery performed daily in hundreds of places throughout the centuries would never have been detected or suspected, or at least hinted at."

The Edelsteins, in short, maintain the cures were real. They accept as *fact* that the supplicants came to the temple, slept, dreamed, and were healed. "Even miracles," they write, "can be accounted for." The new knowledge of the dream cycle aids this accounting. First, we know now that dreams are a natural, biological event. The fact that everyone dreams four to six times in the course of a night's sleep has been conclusively established only within the last decade.

[6] The story of the Asclepian cult makes fascinating reading. Aristophanes gives a slapstick version of a night in the temple in *The Plutus*. Water Pater describes a visit to the temple of Aesculapius (the Greek name) in *Marius the Epicurean*. Professor Carl Kerenyi analyzes the cult from a Jungian point of view in *Asklepios*. New York: Pantheon Books, 1960. Dr. Ernest Jones treats some of the cures as examples of sexual hysteria in *On the Nightmare*, first published in 1931. New York: Grove Press, Inc., 1959.

But certainly the propagators of the Asclepian cult must have suspected 2400 years ago that dreaming was a universal and dependable phenomenon. They knew, then, that their patients could be expected to dream. As the Edelsteins point out, they came with this purpose in mind.

Second, the dreamers reported they dreamed of Asclepius, of their diseases, that they saw the god assisting them or heard his counsels. This, too, seems natural. Coming in quest of the god's help, excited by the long journey, aware of their sufferings, having seen the sights of the sanctuary and having stayed in these surroundings at least for several hours, having read the tablets on which the reports of the portentous dreams and successful cures were inscribed—how could the supplicants fail to dream as they did?

Third, the specifics of the dream content—the sequence of the operations, the prescriptions, the enemas, the equipment used—are also understandable. In antiquity, medicine was not yet a mystery working behind the closed doors of hospitals and universities, unintelligible to the untrained layman. According to the Edelsteins, "surgical treatment . . . was a matter of common knowledge. . . . Everybody could see how drugs were prepared and given. People were used to watching the performance of operations. . . . They were often familiar with medical theories; physicians discussed their cases widely; upper-class education included medical training in late antiquity. The poorer classes, on the other hand, did a great deal of their own doctoring . . . it is not astonishing to find that some of the dreams, even a great many of them, were so technical in content. Indeed, all the main features of these visions are clear reflections of the patients' everyday experiences."

Fourth, assuming the supplicants dreamed, and dreamed in technical detail, why did they get well? How could they have had relief after a mere vision? Some of the cases obvi-

ously must be put down as nervous rather than organic disturbances. Paralysis, deafness, and blindness may have their roots in emotional problems. Sterility can be a hysterical disorder. During a night in the temple other emotions—the exaltation of the soul, the excitement, the hope, the tension, and the anxiety—could all come into play. Nor is it inconceivable that the body's natural healing processes, by coincidence, produced results during the temple sleep. A stone, for example, can come out spontaneously in a seminal discharge. Further, the Edelsteins point out, doctors in antiquity gave up on patients sooner than they do today. The ancient medic, knowing little, fearful of his reputation if too many failures occurred, was more likely to throw up his hands and pronounce many cases "hopeless." As a result the chances were good that "hopeless" cases would recover spontaneously, or at the least show some improvement overnight.

Finally, the relation between faith and healing has not been resolved satisfactorily. A group of Presbyterian theologians and doctors, including psychiatrists, convened in May 1956 to study "The Relation of the Christian Faith to Health." In their report, issued in 1960 by the Office of the General Assembly of the United Presbyterian Church, Philadelphia, they concluded, "There is still so much mystery in the realm of mind-body relationships that we cannot clearly delineate the connections. . . . We are not in a position to make concrete claims about the role played by Christian faith in recovery from illness or in the maintenance of physical and mental health."

In the second century A.D., according to the Edelsteins, the "authority of the Asclepius temples was at its zenith." By then, however, Christianity had grown from "a small and unimportant sect anxious to live undisturbed by others into a proselytizing mass movement threatening to destroy the foundations of ancient religious life." The tide began to ebb:

Asclepius' temple at Pergamum in Asia Minor was wrecked by an earthquake and never rebuilt. In the fourth century Constantine destroyed the sanctuary at Aegae, declaring that "a kind of deceiver of the souls" lurked there. The pillars of the temple were used to build the Christian church a few leagues away.

The fate of Aegae was symbolic. Not only did Asclepius' temples become quarries for the Church, but his methods and healing gifts were also taken over. Sleeping in holy places, or incubation, as the practice became known, was widespread in the Church during the Middle Ages. There were certain churches famous for their cures that built incubation quarters with priests and attendants on duty. The convalescents "engaged in religious exercises as well as giving themselves to rest and quiet." Christian incubation as a means of curing sterility became identified with the Archangel Michael, Saint Damien and Saint Hubert. Ernest Jones, Freud's biographer, reports examples of incubation as late as the eighteenth century in Scotland and Ireland. A report in the *Revue Archaeologique* in 1844 described how a Greek woman and her sick child bedded down before a statue of the Virgin in the church of the Maritsa Monastery in the northern Peloponnese. The woman hoped that the Virgin would appear in her dream and tell her how to cure the ailing child. Mary Hamilton, a Carnegie scholar, reported she saw temple sleep practiced in the early 1900s in primitive, barnlike Greek churches. During religious holidays on Cyprus and Crete, she wrote, while dancing and feasting go on in the villages, "the special supplicants sleep in the church and await divine revelations."[7]

Today the temple-sleep tradition persists in altered form. Pilgrimages are still made to sacred places and holy grottoes.

[7] *Incubation or The Cure of Disease in Pagan Temples and Christian Churches.* London, 1906.

Lourdes, of course, is an example reminiscent in some details of the temples of Asclepius, though the pilgrims would no doubt be surprised to know that they are the latest supplicants in a procession that started 2400 years ago as a cult of dreams.

CHAPTER ELEVEN

A Dream Is to See

More Than Meets the Eye · The Sound of Dreams · High-level Sleep or Low-level Thought? · The Fourth State · "An Excitement from Within" · No Final Curtain

Dreams have usually been defined as visual hallucinations. This is the testimony of both ancient and modern, savage and civilized, witnesses. The Zulu, a typical case of a primitive mentality trying to make sense of the dreams of the night, concluded that their souls went on sight-seeing excursions. Zulu seers who had regular concourse with dream phantoms were said to "live in a house of dreams." In the straightforward Ojibwa idiom, the dreamer is said to "see when asleep"; Goethe used a similar visual image when he referred to dreams as "whimsical pictures." Plato, as perplexed as the Zulu, assumed that dream perceptions must

necessarily originate from a source different from that of waking perceptions. He therefore placed the dream in the liver—along with the hallucinations of the madman—and located rational thought in the head. More recent philosophers have also emphasized the visual nature of dreams, but have relocated them from the liver to the head. David Hume, for example, held that imaginative thought and dreams differed only in their "force and vivacity." The American psychologist G. Trumbull Ladd, a contemporary of Freud's, proposed that some dreaming took place in the retina. And Freud, in one of his most succinct phrases, called dreams "thoughts transformed into images." This lesson of the master, as well as the Ojibwa idiom, is reflected in *A Hole Is to Dig, a Child's Book of First Definitions*, written by Ruth Krauss and intended for American six-year-olds. A dream, the young reader is told, "is to look at in the night and see things."

With the development of the new techniques for monitoring dreams, it has become evident that the definition of dreaming as a purely visual event may have to be modified. At the same time new discoveries in brain physiology and neuroanatomy now make it possible to define with some precision the nature and source of dream thought. In the course of these redefinitions, the accepted definitions of sleep, of consciousness, and of thought—themes central to this narrative—may also have to be revised.

MORE THAN MEETS THE EYE

The visual character of dreaming has always seemed to overshadow any other sensory elements that might be present. Even when the new methods for monitoring dreams were devised, it so happened that the first discovery made

was of the rapid eye movements, which seemed, metaphorically at least, to watch the action of the dream. A few years later the versatile techniques of electroencephalography were used to vindicate the metaphor. Drs. Edward V. Evarts and Peter R. Huttenlocher of the United States National Institute of Mental Health and D. H. Hubel of the Walter Reed Army Institute of Research surgically opened the skulls of live cats and inserted thin, needle-like recording electrodes into the deeper portions of the brain. At the top of the skull the electrodes terminated in a plug which was permanently implanted, and the opening was sewed up. From the plug, wires (kept slack so that the cat could move about with no trouble), led off to an EEG machine and other recording devices. These chronic intact preparations, as the wired-up cats were called, have continued to live normal laboratory lives for years despite the hardware in their crania. In one such experiment Hubel found that during the periods of dream sleep there was greater electrical activity in the nerve cells of the visual cortex (the area of the gray matter connected by easily traceable nerve pathways to the optic nerve), than during the normal waking hours.

Later, of course, as more dreams were monitored by Kleitman and his associates, other physiological patterns became evident. The fast, low-voltage pattern on the EEG machine was shown by Drs. Dement and Wolpert to be a more inclusive indicator of dreaming than the REMs. Whenever subjects were awakened during this distinctive brain-wave pattern, they invariably reported a dream, whether or not rapid eye movements were present. This led Dement and Wolpert to suggest that in general there were two categories of dreams: "active" dreams, whose visual imagery was reflected in the rapid eye movements, and "passive," or non-visual, dreams with little or no REMs. In 1959 Drs. Offenkrantz and Wolpert confirmed that there were non-

visual dreams in a series of experiments with a congenitally blind thirty-nine-year-old man. In the course of two nights' monitoring in the standard fashion they obtained six dreams from their subject when they awakened him during the Stage I EEG pattern. In each instance the dreams were without visual imagery; they involved instead speaking, listening, thinking, and feeling, as in this example:

. . . I was talking to my friend and holding the baby in my arms . . . and the reason I knew it was my friend was because I recognized his voice. . . . I knew it was the baby because I was holding it and it had the baby hair on its head. . . . I could feel the chair I was sitting on was the one in my living room. . . .

As the dream-monitoring techniques were refined, other regular non-visual accompaniments of dreaming were discovered. Three of these accompaniments have been mentioned: one, the intense, visceral turmoil of the autonomic nervous system (Chapter Six); another, the easily observable body twistings, turnings, and shiftings which may signify the end of a dream episode (Chapter Five); the third, electrical muscle activity which seems to pantomime dream activity. These latter movements, recorded by Dr. Edward Wolpert electromyographically (that is, with electrodes that measure changes in the muscles' electrical potentials), were particularly mystifying. When Wolpert observed sleepers directly in the darkened room at Abbott Hall, he noted that the movements were "small and not recognizable as the complete act" of a waking person carrying out the same activity, as in the dream of the bucket carrier, or the dream of the man jumping over the fish. Moreover in many instances the micromovements were so minute that Wolpert could not detect them visually, even though he was intently

watching the limb while the EMG was recording the muscle activity electrically.

Wolpert, in his report on the EMG work in the *Archives of General Psychiatry*, offered two possible explanations for the electromyographic potential noted. They are based, in part, on the arresting ideas of the physiologist Edmund Jacobson, who proposed in the early 1930s that various forms of "thinking" are accompanied by appropriate changes in body muscle tensions. Dr. Jacobson demonstrated this with a modified version of the standard electrocardiograph machine, an oscilloscope, and fine platinum electrode pins that he stuck into his subjects' muscles, including the muscles of the jaw, forearm, thigh, and forehead. "Think of lifting a 10-pound weight, slowly, with your left arm," Jacobson commanded a volunteer, appropriately wired with electrodes. The oscilloscope screen registered steady muscular tension in the left arm, reflecting, so Jacobson maintained, neuromuscular tensions "subtly responsive" to the thought. This suggested to Wolpert that either the potentials directly reflect the action of the dream in the muscles appropriate to the action or that the potentials reflect a more general muscular discharge throughout the body as the act is hallucinated.

THE SOUND OF DREAMS

Another possible physiological accompaniment to dreaming is subvocal speech, or words organically articulated in the larynx but not voiced or whispered. The notion that people vocalize their thoughts, awake and asleep, is not as extravagant as it sounds. Writers have been seen "talking" to their typewriters, parents can testify to throat-muscle activity and lip movements in their sleeping children, and reports of subvocal speech during thought can be found in

scientific literature. In 1949, for example, Dr. Louis N. Gould actually recorded the auditory hallucinations of a forty-six-year-old widow, a paranoid patient at the Norwich, Connecticut, State Hospital. The woman was convinced that the Russians constantly spied on her and were trying to destroy her with an invisible ray. For some time, she reported, "voices" had been speaking to her through an electrical current. The voices she heard were her own subvocal productions. According to Gould's report in the *Journal of Nervous and Mental Disease* for May 1949, he was able to pick up these "voices" by placing the bell of a stethoscope near her mouth and amplifying the sounds with a high-level electronic tube and a sensitive microphone. Earphones permitted him to listen directly and a Soundscriber was used to record the sounds for later study. Distinct words, even sentences were recorded, as in this example:

"Something worse than this. . . . No certain not. . . . Not a single thing. It certainly is not. Something going on. That's all right. Anything around. Not very much. Something else. Looks like it isn't. . . . It's just what I know. Something funny about it. Anything doing. Anything else. Get near it. Every single thing. No, I don't think so. But this one. Society. I don't expect anything."

There has been at least one attempt to determine whether there is subvocal speech during sleep that might correspond either to the imagined conversations or exclamations of the dream or to the dream images. At the University of Chicago investigators recently attached electrodes over the larynx of a sleeping subject. While they heard activity in the "voice box," the elements of speech could not be differentiated clearly enough from swallowing and heavy breathing to be of value in analyzing speech in dreams.

These difficulties, however, may soon be solved by new advances in electronics technology, specifically by the de-

velopment in 1960 of an artificial larynx by the Bell Telephone Laboratories. These small cylinders, transistorized and powered by tiny batteries, transmit vibrations into the lower end of the vocal tract when pressed against the flesh of the throat. In surgical cases where the "voice box" has been removed, the cylinder takes the place of the larynx, its sounds converted into the syllables of speech by the normal articulations of lips, teeth, and tongue. In its special application to dream monitoring the artificial larynx would be designed to produce an ultrasonic sound outside the audible range of the sleeping subject so that he would not be awakened. Hopefully an ultrasound speech reflecting the auditory activity in the dream would be produced, recorded, and later transcribed into audible speech.

HIGH-LEVEL SLEEP OR LOW-LEVEL THOUGHT?

Each of these elements—the rapid eye movements, the fast brain-wave patterns, the heightened activity in the visual cortex, the visceral turmoil, the body twistings and turnings, the micromuscle movements, and the likelihood of subvocal speech—when taken together reflect, paradoxically, a state of multifaceted activity during the supposedly reposeful hours of sleep. For a time in the "old days" of dream research at Chicago it seemed that it might be possible to explain each of these elements in terms of "light sleep," a twilight zone between wakefulness and deep sleep. But recent experiments conducted at several laboratories have subtly discredited this idea to some extent; using the varying volume of the arousing bell as a yardstick, experimenters have found it sometimes takes *more noise* to wake a sleeper when he is in so-called light sleep than when his EEG shows

he is in the deepest of deep sleep. Still the situation is not completely inexplicable. The paradox of "deep-light sleep" is, it seems clear, related to dreaming. Major Harold Williams of the Walter Reed Army Institute of Research, one of the investigators who has measured the varying volume of the bell in relation to levels of sleep, likens the dreamer in the experiments to an adult sitting in a chair reading an engrossing novel, say, *Lady Chatterly's Lover*, while his children clamor about him, trying to distract him to fix a roller skate or come outside and play catch.

How, then, describe dreaming? Is the dreamer in a state of low-level consciousness or in a state of high-level unconsciousness? In the past, Kleitman and Dement pointed out in their report on EEG and dreams in the journal *Electroencephalography and Clinical Neurophysiology* in 1957, physiologists faced with the onerous task of defining "consciousness" have taken the easy way out by "equating consciousness with wakefulness and unconsciousness with sleep." But, as the new findings make clear, "a high level of consciousness is not always limited to wakefulness . . . sleep [does not] always imply a very low or zero level of consciousness." In contrast to the alcoholic (behaviorally awake at a bar, but in *delirium tremens*), the sleeper (behaviorally asleep in bed, but dreaming) is mentally alert; he is capable of considerable activity, he is busily occupied in some form of physic processes, he will be able to remember something of what went on the next morning and, as Dement (page 223) and Granda and Hammack demonstrated (page 226), he may even be given a task to do. Confronted with this situation, it is becoming increasingly difficult, as Kleitman pointed out, to maintain the old distinctions between consciousness and unconsciousness and wakefulness and sleep. One tentative solution is to consider dreaming as a separate state of being.

THE FOURTH STATE

"Our normal waking consciousness, rational consciousness, as we call it." William James noted in 1902 in the *Varieties of Religious Experiences*, "is but one special type of consciousness, whilst all about it, parted from it by the filmiest of screens, there lie potential forms of consciousness entirely different. . . ." James was writing from personal experience; he had investigated the effects of nitrous oxide, the so-called laughing gas, upon his waking behavior. Since earliest times man has known that certain plants and narcotics could profoundly alter the perceptions he held of himself and of his universe.[1] Mandrake root, deadly nightshade, Jimson weed, and henbane have yielded powerful alkaloid narcotics for his religious and magical rites. The drug mescaline, derived from the dried, buttonlike tops of the peyote cactus indigenous to Mexico and the Southwestern United States, parts this Jamesian filmy screen in about thirty minutes. The behavioral and physiological aspects of this parting have been studied under controlled laboratory conditions. Hallucinations appear, the sense of time is disjointed, ordinary colors become bursts of light painted by Van Gogh. The paths of sensory transmission are affected. In the brain tissue the drug causes a diminution of metabolism. Blood pressure and heart rate decrease, the pupils dilate, speech thickens. There is no mistaking this altered form of consciousness.

Judged by the same standards, the state of dream sleep is another form of consciousness, also parted by the filmiest of screens from waking consciousness. Sleep is usually re-

[1] Cf. Thomas De Quincey, who said he wrote his *Confessions of an Opium Eater* "in order to reveal some of the grandeur which belongs potentially to human dreamers."

garded as a negative process, merely the absence of certain waking qualities like perception, movement, and attentiveness. But as Professor Donald O. Hebb pointed out in 1949 in his book, *Organization of Behavior*, "going to sleep means the positive substitution of one organization for another."[2] The wide range of physiological and psychic activity which has been subsequently noted during dream sleep testifies to the wisdom of Hebb's observation. And recent findings in the field of neurophysiology suggest what this state of organization might be.

First, working with cats, Huttenlocher found that the higher electrical activities that Hubel had noted in the visual cortex during sleep could also be recorded in the reticular formation. Then Evarts, in exquisite experiments conducted since 1959, related these discharges to the dreaming state and demonstrated that other factors are involved as well. Over the last three years the techniques of implanting electrodes in the brains of cats were improved to the point where Evarts was able to "listen in" on the electrical activity of a single neuron, or nerve cell, with a fine tungsten electrode. His results have been reported in the *Federation Proceedings* for December 1960. He found that a majority of neurons in several different cortical areas discharge, or "fire," more frequently in dream sleep than they do in non-dream sleep. They even fire more frequently during dreaming than during a state of relaxed wakefulness. Only during the active movements or perceptions of the attentive waking state (the concentration needed, for example, to follow this narrative) does the level of neuron activity reach the level that occurs during dream sleep. This firing of the nerve cells in the brain is now thought to be the net result of a delicate balance between exciting impulses and inhibiting impulses. The source

[2] *Organization of Behavior*, by Donald O. Hebb. New York: John Wiley & Sons, Inc., 1949.

of these exciting impulses is twofold: the activity of the sensory organs like the eyes and the ears, and the ideas and thoughts of the memory. Each can cause the neuron to fire, depending on the state of inhibition. The source of the inhibition is the reticular formation.

These findings have led Evarts to conclude that the thinking state, the state of relaxed inattention, the dreaming state, and "true" sleep can be differentiated along a scale of inhibition-excitation. The cerebral organization of the alert waking state, he suggests, is maintained as a result of a continuous stream of inhibitory impulses coming from the reticular formation in the brain stem. The role of the reticular formation in arousing higher regions of the brain has been described in general in Chapter Eight. Specifically, when the alarm clock rings in the morning, the stimulus travels from the ear via nerve pathways to the reticular formation and to the auditory area of the cortex. The reticular formation "awakens" the cortex so it can hear the signal. Once the cortex engine is started, however, it does not run without aid; the reticular formation continues to send inhibitory signals throughout the day. Because of the strength of these signals, only the *stronger* excitatory impulses of sensory perceptions can cause the neurons to fire. At night the process is reversed: the stream of sensations to the reticular formation slows; the reticular formation in turn exerts less inhibitory control over the cortex. The weaker impulses of ideas and thought from the memory can now cause the neurons to fire; hardheaded perceptions give way to the visions of dreams; full-scale activities become the abortive movements that have been shown to accompany dreaming. Finally there is a marked loss of inhibition in the cortex, so marked that, in Evarts' words, there is not enough "patterned activity" in the cells to sustain dream thoughts.

Some recent experimental observations confirm the es-

sential accuracy of this description. Not long ago, when subjects in the Chicago dream laboratory were systematically awakened *between* the distinct dreams of the night and interrogated, they often reported that they were "thinking." But the "thinking" that was going on was unlike dream thought and unlike waking thought. It had an eerie quality. The following samples illustrate what, for lack of a better name, might be called "sleep thought":

Nothing was happening. I seemed to be talking to Kennedy—President Kennedy . . . I don't remember seeing him. . . .

I sort of was thinking. It wasn't like a dream, though. . . .

It was something about a boy I know—a friend. . . . There was a mental blank. . . .

I was thinking about a camera. . . . It was a camera I wanted to buy. . . . I was thinking about how much it would cost. . . .

The nearest comparable experience, Dr. William Offenkrantz suggests, might be the kind of background thought that goes on when one is driving a car. "If the person sitting next to you in the car suddenly asks, 'What were you thinking about just now?'" Offenkrantz says, "how many times can you tell him what has just gone through your mind?" The full implications of the "sleep thought" are only now being investigated. As of now, it seems that the brain never rests, that some kind of mental activity goes on continuously. The apparent empty stretches of time during sleep, as Professor W. F. R. Hardie of Oxford has suggested in his lecture "Bodies and Minds" (reprinted in *The Listener* for April 14, 1960), "are filled by psychic processes of the most subdued kind. . . ."

"AN EXCITEMENT FROM WITHIN"

Attentive perception, relaxed wakefulness, dreaming, and sleep, in summary, can best be described as a continuum of psychic activity, different readings on a scale of consciousness. As Kleitman has observed, "One may omit the use of the term unconsciousness and merely refer to levels of consciousness varying from zero to a high level, depending on the communication and performance of the individual." Thus there is no need to assign the dream facility to the liver as Plato did, or to the eyelids as Professor Ladd did. William James hit the mark when he suggested in his *Principles of Psychology* that the dream must consist of "an excitement from within of those centers which are active in normal perception . . ." The excitement of dreaming, along with the stronger excitements of alert waking thought and the weaker excitements of sleep thought, "take place" in the brain. Exactly where, of course, is difficult to say, but a likely location is the nerve-fiber circuits connecting the visual area in the cerebral cortex with the reticular formation in the brain stem.

As Professor Wilder Penfield, writing in the journal *Brain* (Vol. 81, 1958), concluded, "There is no room or place where consciousness dwells. But there is a place, a region of the brain, in which neuronal activity makes conscious thinking possible. Consciousness exists only in association with the passage of electrical potentials through ever-changing circuits of the brain-stem and cortex." Drs. Arnold and Madge Scheibel, a husband-and-wife research team at the University of California Medical Center in Los Angeles, have carefully studied the brain-stem end of this circuit—the network of ten million neurons in a matrix of fibers, collaterals, and

terminals that make up the reticular formation. A summary of their work and the related work of others is being published as part of the *Symposium on Hallucinations* under the auspices of the American Association for the Advancement of Science and the American Psychiatric Association. The Scheibels found that this network sends out long, branchlike axons to every part of the body, and thus participates in every neural function, from sensation at the surface to the ultimate hierarchal level of the brain. "Our windows on the external and internal world," they conclude, "are under reticular-formation control." When this control decreases, as in normal sleep, laboratory sensory deprivation, the extreme fatigue of the shipwrecked, and the changed metabolism of the drugged, the view shifts from the external to the internal world.

The nature and location of this internal world have been suggested by the temporal-lobe work of Dr. Penfield, described on pages 140–41. As Evarts suggests, during the state of attentive waking the exciting impulses from the senses are dominant, while memories are always supplementing the perceptions. Dr. Penfield, in the journal *Science* for June 26, 1959, has described brilliantly how the memory "acts": "After years [you meet] by chance a man whose very existence you had forgotten. On seeing him, you may be struck by a sudden sense of familiarity, even before you have time to 'think.' A signal seems to flash up in consciousness to tell you that you've seen that man before. You watch him as he smiles and moves and speaks. The sense of familiarity grows stronger. Then you remember him. You may even recall that his name was Jones. The sight and the sound of the man have given you an instant access, through some reflex, to the records of the past in which this man has played some part. The opening of this forgotten file was subconscious. It was not a voluntary act. You would have

known him even against your will. Although Jones was a forgotten man a moment before, now you can summon the record in such detail that you remark at once the slowness of his gait or a new line about the mouth."

In the dream state, and in the other states of altered consciousness, the ideas and thoughts of the memories become dominant and the external stimuli supplementary, as Dement and Wolpert demonstrated in their version of the original Maury experiments. The opening of the forgotten file is paced by some at present little-understood clock or clocks. It takes place through the night in the dream whenever the cortex is right.

NO FINAL CURTAIN

The regular nightly unfolding of several dream episodes has been likened to a play, and the dreamer to the audience. In the same spirit this book is a review of a play and its author a reviewer, somewhat in the position of a morning-newspaper critic who must leave before the play is over. His review is incomplete. The story of dream research is by no means over. Complicating factors and new elements are still being introduced; it may be years before the many issues raised in this narrative are resolved. But the story so far unfolded is an exciting, exalted, and already rewarding one. In another field of exploration, man has now demonstrated that he can control a ship in space. He may soon have satellites that can predict—and perhaps order—the forces of the weather. His radio telescopes and interplanetary probes may find the final secrets of the universe. It remains now for man to see whether he can control and predict, or at least understand, his own nature and the dark forces and final secrets within himself.

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of the dreams of both normal and abnormal dreamers; and many other aspects.

THE SCIENCE OF DREAMS is a lively critique of an increasingly important phase of everyday psychology, written in a form both appealing to the general reader and challenging to the student.

EDWIN DIAMOND has covered and written about the major science stories of the last decade. A veteran of World War Two, he was graduated from the University of Chicago with a master's degree in 1949. After a brief teaching career at the University, he worked on newspapers and for the International News Service in both Washington and Chicago. In 1957 he became Science Editor of *Newsweek* and in 1961 was named a General Editor. His stories have won awards from, among others, the Chicago Newspaper Guild, Washington Newspaper Guild, and the AAAS-Westinghouse science writers' competition. He lives with his wife and three young daughters in Port Washington, New York.

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Here are some of the key questions in

THE SCIENCE OF DREAMS

Q. Are there any people who don't dream? **A.** No, everybody dreams.

Q. Do midnight snacks or tension make us dream more? **A.** No, a bedtime sandwich or emotional upset can make you remember your dreams better but they do not affect the amount of dreaming itself.

Q. Do we move around when we dream? **A.** No, just the opposite. The body is restless and moving between dreams but calm once we start dreaming.

Q. Do dreams happen in a flash? **A.** No, the dream takes as long to unfold as it would if performed in waking life.

Q. Can a person be made to dream? **A.** No, we can change what is being dreamed, for example by flashing a light in the dreamer's face, but we cannot bring on a dream.

Q. Can dreams be prophetic? **A.** No, except perhaps when they warn the dreamer of incipient physical and mental illness.

Q. What do we dream about? **A.** Everything that affects us emotionally and personally, or creates conflicts. But usually we do not dream about things that are a part of our daily routine; for example, a housewife does not dream about household activities nor businessmen about routine aspects of business.

Q. Why do we dream? **A.** It acts as a safety-valve for our emotions and tensions. Some authorities suggest that dreaming is the poor man's TV in which the dreamer "produces" and "directs" his own entertainment through the night.